VIA SCHOLARIUM

A COLLECTION OF
HONORS COLLEGE STUDENT THESES

TABLE OF CONTENTS

SPRING 2022 THESES

A FEW WORDS FROM THE DEAN

One of the best parts of my job is that I get to take such pride in the excellent work that Honors College students do. Much of that work is represented by the theses presented in this volume. The projects that Honors College students take on give us a sense of what matters to students and what their and our future holds. This particular group of students has taken on a vast array of research topics ranging from racism in nursing practice to new approaches to mental health to the effects of the coronavirus pandemic on work lives and student lives and so much more. Each project presented herein represents many hours of work for which students should be very proud. They have perfected their research and writing skills while making interesting contributions to their respective fields and have prepared themselves for the next phase of their lives. What becomes evident in reading these theses is that these students are passionate and curious, that they are accomplished and talented, and that this is just the beginning of their life-long learning and success. These are students whose academic careers were deeply affected by the pandemic and yet, they persevered. Many of them had to change their research projects because labs were closed, schools were closed, clinical processes were disrupted, and many courses were online. In spite of those challenges, these students persisted and were able to produce impressive results. By sharing this inspiring volume of their work with you, we invite you to celebrate their accomplishments and relish the fascinating projects presented.

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WOMEN IN NONPROFIT LEADERSHIP: SUCCESSFUL OR NOT?

We know of many well-known and famous female leaders. Michelle Obama, Ruth Bader Ginsberg, and Oprah Winfrey all are common names that are more recently praised for their impact through their leadership. But, what about women in the common workplace, more specifically, women in nonprofit organizations? There is something that doesn't seem to be prevalent when thinking of women in leadership. There are women in nonprofit leadership, but they don't seem to be recognized among their employees or society in general. Women in nonprofit leadership are breaking barriers and leading their organizations to greater heights. But, what specific personality traits does a woman in leadership possess that makes her most successful among male and female employees in the nonprofit sector? That is the purpose of this research. Women who want to be leaders in a nonprofit organization need to know what characteristics to develop in order to be viewed by their employees as effective leaders with authority. For this research, women in leadership positions were considered to be those that hold management level positions within their organization. They could be Vice Presidents, CEOs, etc.

Throughout my research, I will determine what specific character traits, if any, prove to be the reason that women are successful leaders in nonprofit leadership. Surveys from employees at nonprofits will distinguish if their female leadership has had a positive impact on them and the organization. Survey questions include their gender, whether or not they are in a managerial position, their past experiences with female leadership, and more. If it is found that certain personality traits deemed these leaders as respectable and successful, those traits will play a vital role in how females lead nonprofit organizations. With the new knowledge of how they should successfully run a nonprofit organization, women can adapt their leadership styles to their organization and how their employees respond. If it is found

that no certain personality traits deemed leaders as respectable or successful, this will likely not impact leadership styles as it is uncertain if a certain style of leadership is more effective, in terms of respectability and success. A basic definition for leadership according to a simple google search defines Leadership as "the action of leading a group of people or an organization." For the purposes of this research, I am considering anyone in a managerial position to be a leader in their organization. I am also defining success as a person in a leadership role who is well-liked and respected amongst co-workers. They have a good relational balance between task-oriented leadership and relationship-based leadership. This research can be vital for women in the workplace, specifically in nonprofit workplaces.

LITERATURE REVIEW

Nonprofit Leadership

 Nonprofit Leadership as a whole, despite genders, is not where it should be or needs to be according to "The Wake Up Call: A Study of Nonprofit Leadership in the US and Its Impending Crisis" by Adrian Sargeant, PhD & Harriet Day. Sargeant and Day claim that "67% percent of leaders are planning to leave their position in the next 5 years" (Sargaent and Day, 9). Seargant and Day conducted a study on how lack of leadership is causing nonprofits to rot in turmoil. The study focused on guiding non-profit leaders into a stage of transformational leadership. Leaders in the nonprofit sector are feeling underappreciated, undervalued, and unseen. Leaders in the nonprofit sector do amongst the most important work for our society, creating and doing good. It is shocking that Seargant and Day found that "only 21.4 % of leaders have a very great degree of confidence in their leadership abilities" and "almost 10% have little confidence in their ability to lead" (2018).

Sargaent and Day's analysis concluded that very little appraisal of leadership seems to be taking place amongst nonprofit leadership. It is difficult to make necessary changes to be successful, if you are unsure of what is going wrong. Nonprofit Leadership must be diversified, confident, and heart felt for certain organizations to meet the needs of their target audience. While Sargaent and Day focus on the overall lack of leadership that is taking place in non-profits, where are the women in the nonprofit leadership being placed in this lack of leadership conversation?

Men in Nonprofit Leadership

Kathryn Luna wrote "Breaking Barriers and Building a Pipeline for Women's Leadership Success in Nonprofit Organizations'', this study being among one of the only ones that are out there in the world of literature that focuses on the struggles that women face in leadership and how they can overcome. Luna spots on how society crafts the narrative of pitting men and women against each other from the beginning. Men are described as having "a linear path to leadership" (Luna). Leadership stereotypes are even being gender assigned as masculine. Marco Tavanti wrote an article called "Nonprofit Women Leadership'' in which he slightly highlights the struggles that women face in breaking the barrier between themselves and leadership in the nonprofit sector. Tavanti wrote that men are "...take charge" and women are "...take care" (2016). This is suggesting that men are the leaders in the room, historically, they always have been. Ronquillo, Hein, and Carpenter who wrote "Reviewing the Literature on Leadership in Nonprofit Organizations" conducted a study on the focus of literature surrounding nonprofit leadership and how solely focused the organization's success is dependent on the leadership, executives and board of directors. Ronquillo, Hein, and Carpenter (2012) highlighted the fact that men are among the top leaders in churches and universities, historically and presently. Nothing has changed, history is repeating itself with the continuation of males dominating leadership roles. Women are still not a part of the leadership conversation that is taking place. Luna wrote, "Women are rarely receiving opportunities for upward mobility, and typical management practices focus on promoting males." Women are being passed over, simply because they are women. Men can be a part of the solution for the advancement of women in leadership, "it is important for not only women to support women, but also both women and men to commit to promoting women, amplifying their accomplishments, nominating women for difficult jobs, and calling out gender bias" (Luna). While these works of literature bring women into the leadership conversation, they bring men right alongside them. My research aims to focus solely on females in the nonprofit sector and how their personal leadership style can contribute to their success and the organization's success.

Empowering Women in Nonprofit Leadership

The conversation around women in nonprofit leadership is slim to none. There are conversations around nonprofit leadership and men in nonprofit leadership, but where are the women in nonprofit leadership? Women are not being brought into the conversation when discussing nonprofit leadership, and that right there is the problem. "Breaking Barriers and Building a Pipeline for Women's Leadership Success in Nonprofit Organizations" by Kathryn Luna is one of the very few articles that solely focuses on women in leadership in the nonprofit sector. From when they are young, girls are taught to be quiet, polite, and respectful. "I want every little girl who's told she's bossy, to be told instead that she has leadership skills." (Luna, 2019). Luna quotes several articles about women in leadership, "Leading Like A Boss" by Andrea Heauston, argues that there are three undervalued traits that women possess: "grit, passion, and tenacity" (Luna). Women find themselves taking a scenic route to leadership positions where men take the linear path, as Luna previously mentioned in "Breaking Barriers and Building a Pipeline for Women's Leadership Success in Nonprofit Organizations". The same is being said for for-profit companies, women are not being empowered and pushed forward in career advancement opportunities. Elias, who wrote "Lessons Learned from Women in Leadership Positions" (2018) noted from a woman who had found success in her for-profit workplace, that "help(ing) boost career, skills, and retention" was what she had found to be the key to success. Calling out gender bias is amongst the most recommended tools to combat this fight against women. "How Organizational Culture Shapes Women's Leadership Experiences" by Longman, Daniels, Bray, and Liddell (2018) found that "leadership development for women contributes to shaping organizational culture such as fit, power of choice, and personal confidence." Society is the determining factor to change the stereotype surrounding women in nonprofit leadership. The change for women starts from youth and must be a change widely accepted by parents, friends, family, and society. These articles that supported Kathryn Luna in her study are all about how from the beginning, little girls need to be reminded how important they are, how much they contribute to society, and how they are allowed to be and encouraged to be loud, smart, vibrant. These little girls will then grow up to be leaders who can change the very world we live in today. That is how we empower women to be a part of the nonprofit leadership conversation that is taking place today. When we empower women, we can then find out what characteristics that woman who is successful and respected among her co-workers possesses that make her so successful and respectable, which is what my research aims to do. While these articles are a part of empowering women to be in leadership roles, my research aims at discovering what specific character

traits attribute to women's success in a nonprofit leadership role.

METHODOLOGY

When conducting this research, I received Institutional Review Board approval on March 18, 2021. Surveys were then sent to numerous nonprofit organizations. To qualify to participate in this research, nonprofits had to have been granted tax exempt status by the government, as well as their mission had to be focused on improving the lives of children or families. Survey participants were from nonprofit organizations such as Make-A-Wish Georgia and Guide Outreach. The survey consisted of 13 questions. The survey was designed to elicit the inner thoughts of employees on female leadership and discuss in a safe environment, their true thoughts and feelings towards their experiences in the workplace.

DATA AND ANALYSIS

After surveys were completed and collected, I began to decompress the information that was packed into the results. 100% of survey participants agreed to participating in the survey and understood risks and benefits. 80% of respondents identified as female, while the other 20% identified as males. Majority of responses were from females on their female supervisors, this will add an interesting spin on results as women may be kinder or more judgemental when evaluating other females in leadership. 70% of respondents held a management position within their organization, while 30% did not hold a managerial position. Majority of the respondents holding a managerial position, while the majority of respondents were female is interesting as my research basis is on whether or not women in leadership positions are successful or not. 100% of respondents had had a female supervisor at their current organization. This data proves that women are making themselves known in the workplace and are combating male counterparts for management level positions. Following are tables to help depict the results.

Q2 - Gender:

5
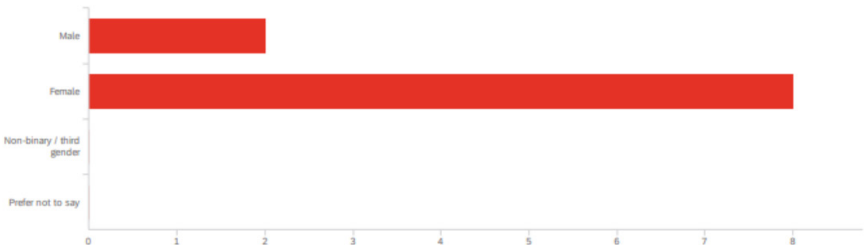
Q4 - Are you in a management position within your organization?
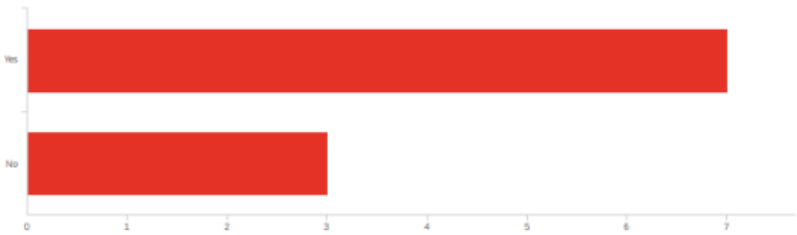
Q5 - Have you ever had a female supervisor at your current organization?

100%
Yes

■ Yes ■ No

The remaining questions were short answer responses. However, there were underlying themes that were common amongst responses for each question. 60% of respondents explained their experience with a female supervisor was a positive experience. Majority of respondents based their positive experience on the fact that their female supervisor was a "change maker" and/or a "team player". The respondents who identified their female supervisor experience as a positive one listed a few character traits of that female supervisor, such as how she was willing to support their mission always, held priorities both inside and outside of the workplace, and she "strives for innovation". 10% of respondents stated their experience with a female supervisor was a negative one, stating that the said supervisor "had a competitive nature". One might argue that women are forced to be demanding, strong willed, and competitive in nature due to the simple fact that she is female. 30% of respondents stated their experience was a mix of positivity and negativity. Respondents of the 30% who were mixed suggested they had opportunities to grow with the supervisor, but it was a competitive atmosphere. Another said they felt supported and heard sometimes, but not all the time. Another respondent suggested that their supervisor was a kind and generous woman, but the supervisor had grown complacent with their role. These results gather that while women are holding leadership positions, and a majority of their employees are satisfied with their leadership skills, some employees felt the female supervisor created a competitive culture or

had grown to be too complacent in their role to craft change and an innovative workplace culture.

Specific character traits were listed in response to the question, "What do you think are the specific traits of a female supervisor that made this experience a positive or negative experience?". Among those listed the most popular responses for traits that made the experience positive were "detail oriented", "effective decision maker", "determined", "passionate", "knowledgeable", "intentional", "high emotional intelligence", "values work-life balance", and "compassionate". These character traits were noted for a positive experience with female leadership, which are also very correlative of character traits attributed to successful leadership, regardless of gender. Character traits that were attributed to a negative experience included, "competitive", "selfish", and "lack of commitment", and "micromanager". These characteristics could also be attributed to the downfalls of men in leadership. Female supervisors may feel the need to overcompensate in competition to feel like they are on a level playing field with men.

When asked, "Do you feel the traits and characteristics for a female supervisor/leader to be successful differ from those of her male counterpart?" respondents gave many different answers. Some respondents felt that traits and characteristics for a female leader to be successful should not and do not differ from those of her male counterpart at their organization. Other respondents felt that they did and had to differ in a complete opposite way than that of their mae counterparts, one respondent wrote, "I think it definitely depends on the setting, but generally, yes, I think female leaders are expected to act in a certain way that is a bit different than male leaders. I think male leaders can be more stern, direct, blunt, etc. and be seen as strong leaders, but when women act that way, they can be seen as harsh, unapproachable, etc. So I think female leaders are expected to be a bit kinder, softer, more approachable, etc. I don't think this is always the case, and I also hope it's something that's changing more with more strong women in leadership." Other respondents felt success was not dependent on gender, but rather the individual's personality and character.

When respondents were asked, "What are specific traits that you would attribute to a female leader that gains her respect among her co-workers?" They suggested that many traits attribute to a female leader gaining respect from her co-workers. Those responses included "active listening and leadership", "integrity", "holds true to her principles", "team oriented", "approachable", "confronts difficult situations head on". Empathy and Kindness were amongst the most repeated traits that respondents disclosed as traits that attribute a female leader with respect. When asked, "What are specific traits that you would attribute to a female leader that allows her

to be successful in her position?" respondents proceeded with a plethora of character traits. Respondents noted that women who are experts in their field, have drive, are bold, have courage, have tough skin, and have a hard work ethic are successful in their positions. However, many respondents responded that they believed the same character traits that allow for a female leader to be respected are the same traits that allow for female leaders to be successful in their roles. Does respect mean success?

Respondents were then asked what they thought their biggest opportunity to grow as a leader was. Many respondents did not answer this question. Amongst the 30% that did respond, their answer choices varied. Respondents stated they felt their biggest opportunity to grow as a leader was "Becoming more comfortable having hard conversations/addressing conflict", "Having a seat at the table with key constituents (national leadership, board members, major donors)", and others stated, "Being able to speak up for the team". The common theme for the respondents in growing as a leader was to get better at having difficult conversations and knowing how to manage their voice in the organization. Only 30% of respondents chose to answer the question that asked what their biggest strength as a leader was. Responses included laying out expectations, qualifications and credentials, open-mindedness and willingness. It is interesting to note that many respondents chose not to participate in the questions that made them dive deeper into their leadership styles. It is also important to note that their responses to questions about their leadership styles did not align with their responses to the leadership of females that they had experienced.

The interpreted data has shown that women who work in a nonprofit organization who gain respect and display certain character traits are more likely to be successful rather than a woman in nonprofit leadership who does not gain respect and does not display these certain characteristics. Based on the results from the survey, to gain respect from co-workers and subordinates, a woman in nonprofit leadership should be an active listener and leader, hold true to her principles, be team-oriented, and be approachable. Women are believed to have to earn respect rather than having it from the start like their male counterparts. Based on these survey responses, to be successful a woman in nonprofit leadership should gain the respect of their employees, and display character traits such as display expert knowledge of their field, a drive, be bold, and have a great work ethic. The results show that women in nonprofit leadership roles can be successful with characteristics of a great leader.

CONCLUSIONS AND FUTURE RESEARCH

Results are in. Women in nonprofit organizations who are leaders within their workplace are more likely to be successful if and when they gain the respect of their co-workers, as well as display certain character

traits such as being driven, knowledgeable, and having a work ethic. It is important to note that there were limitations to this research. Limitations included the size of nonprofits surveyed, as many nonprofits do not have large employee numbers, the data could be biased based on the small work culture. Another limitation is the gender composition of nonprofits surveyed. The majority of respondents were female, so data could be skewed to a more empowering level. Another limitation is if the employees were truthful or not. Falsification could be a factor that affects data as it would not be the true interpretation of leadership in nonprofits. A woman in leadership for a nonprofit organization means that there is a higher level of critical thinking when it comes to the success of that organization, higher degree of empathy is ensued for employees and members served by the organization. Future research includes the hope to take this research further to change the way society pressures females to stay timid and away from leadership from the time they are born to crafting a narrative that females in leadership roles can be successful. This survey and results can even aid in crafting a step by step guide to success for women in nonprofit leadership. This research can serve as a basis to how that guide to successful nonprofit leadership looks for females. This research can have implications that affect the way nonprofits approach hiring for leadership positions. It can affect the way hiring is done by knowing what kind of leadership is most successful in nonprofit organizations and targeting women (or men) who display those leadership characteristics. The ultimate goal of this research was to discover a way to empower women and target the characteristics displayed that help to make a woman in nonprofit leadership successful. I do believe that goal has been reached, but there is still more work to be done and information to be discovered.

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FINANCE CURRICULUM IN COLLEGE: SIGNIFICANT PREPARATION FOR ENTREPRENEURSHIP

A general consensus about finance is that understanding finances, by having the ability to manage money, is crucial to the success and longevity of a business. However, there is a lack of entrepreneurial driven students in quantitative majors, specifically Finance. In a study conducted in Poland made of a sample of economics students in which 48.3% were Finance and Accounting majors, more than half of the respondents (56.2%) answered that they did not plan on starting-up their own business (Lahutta, 62). The results of this statistical analysis demonstrate the disconnect between the study of finance and the likelihood of pursuing entrepreneurship, despite the wealth of knowledge that can be gained from financial education.

The big question is: how does post-secondary finance coursework prepare students for entrepreneurship? The hypothesis for the research in this paper is that studying finance in post-secondary institutions will prepare students for entrepreneurship in multiple ways. The method of approach includes identifying relevant information from finance courses, course materials, entrepreneurial certification requirements and scholarly sources surrounding the related topic. The results are structured to display key concepts of finance in higher education useful to entrepreneurs and their coinciding entrepreneurial skills from finance majors. The correlation will demonstrate why students who are interested in entrepreneurship will find finance courses useful for the development of a small business. The objective of this research is to address how the needs of entrepreneurs connect with knowledge acquired by Finance majors.

LITERATURE REVIEW

The topic of this research discusses the ways in which the college-level finance curriculum prepares entrepreneurs for finance. It is important to note the obstacles that dissuade entrepreneurs from seeking fi-

nance knowledge from college courses. It is equally important to note why finance courses are necessary to entrepreneurship too. The main themes in the research are: lack of entrepreneurial interest in finance, perceptions of finance education, significance of financial planning, and finance for entrepreneurs. Although many would believe that finance is an important part of business, there are multiple problems in finance that fail to encourage students to explore their entrepreneurial potential.

Lack Of Entrepreneurial Interest In Finance.

Throughout the research of this topic, the lack of entrepreneurial interest seemed like a serious theme to discuss. It is important because it discourages finance students from pursuing their entrepreneurial interests. There is an apparent lack of entrepreneurially driven students in quantitative majors, specifically Finance. According to a study conducted in Poland from a sample of economics students. Out of the sample of students, 48.3% of students were Finance and Accounting majors (Lahutta, 59). The results of the study showed that over half of the respondents (56.2%) did not plan to start their own business (Lahutta, 62). There is a good chance that a large percentage of the respondents were both finance students that also did not plan to start their own business. This statistic is significant to the research of this topic because it demonstrates the ratio of people that study finance in college who are not interested in entrepreneurship.

The factors that form barriers to running a business have been measured and recorded in the same study. One of the major factors that make starting a business harder is that poor syllabi are not fitting the requirements of the modern economy (Lahutta, 62). The results show that 79.9% of the students chose this factor (Lahutta, 62). This statistic is significant because it shows that the curriculum needs to provide the tools necessary to navigate

the current economy. The finance and accounting majors group is the largest percentage of the research sample, with management majors (34%) in second and economics majors (17.7%) last.Therefore, the chance of the syllabi discussed is finance related is highly possible. Gaining a better understanding of why finance students do not plan to start their own businesses entails evaluating course syllabi to show the applicability of finance concepts to the economy. It is important to have an understanding of the economy to know what the market needs, especially as a new entrant to the market.

This study relates to aspiring entrepreneurs because it shows that students in finance do not have an adequate understanding of the market, therefore they cannot apply their financial education to entrepreneurship. There is a possibility that the disconnect exists because the focus of entrepreneurship in finance courses is miniscule. For instance, in finance textbooks there is only a little information about application to small businesses, especially in corporate finance texts. This is important because for someone who has interests in entrepreneurship, they would not immediately see benefits in taking finance courses. Knowing this information proposes the question: Why is there a disconnect of entrepreneurship among students in qualitative majors, specifically finance?

Perceptions Of Finance Education.

According to the article entitled "Factors explaining the choice of a finance major: the role of students' characteristics, personality and perceptions of the profession" by Worthington and Higgs, the choice by college students to study finance curriculum is a result of students' perceptions of structure and interest in the banking and finance profession among other things (Worthington and Higgs, 277). This is interesting because banking and finance professions are not limited to people who have or are in pursuit of a degree in finance nor is the study of finance limited to those professions. The article also states that influence on the choice to major in finance is primarily from the level of interest in the finance profession (Worthington and Higgs, 275). For someone exclusively interested in entrepreneurship, they would not have interests in finance courses or majoring in finance in pursuit of their BBA. This would be great for aspiring finance professionals but for aspiring entrepreneurs this deters them from attaining financial knowledge through courses in college.

One of the largest negative marginal effects on the probability of choosing the major of finance is the perception of the profession as excessively structured (Worthington and Higgs, 275). This is not good for students who are interested in entrepreneurship because even though it is perceived as negative, organisation and structure is of great use to entrepreneurs. Small business owners should use financial plans during the development of their business to establish stability and a foundation. In order to have more appeal

to students, separation of the finance professions to finance courses is necessary. This will allow finance classes to appeal to students who are interested in learning more about finance but are pursuing other disciplines. Clear and concise connections to entrepreneurship are necessary structures that need to be communicated more often to students. For example, a college student interested in entrepreneurship would be more likely to choose to take finance classes when they know that financial plans guide a structure for financing will prepare the company to develop the steps to achieve their financial goals.

Significance Of Financial Planning.

The development of financial plans is how a business records financial goals and tracks progress. To formulate a plan, a company must have a financial policy. In "Fundamentals of Corporate Finance" by Ross, Westerfield and Jordan, the basic elements of a company's financial policy are stated as follows: capital budgeting decisions, capital structure policy, dividend policy, net working capital decisions (Ross, 92). The establishment of each of these elements enables a company to form a financial structure to use as a foundation that will help the company make important financial decisions. For example , the textbook defines net working capital decisions as the amount of liquidity and working capital needed on an ongoing basis. Having a general idea of the minimum amount of liquid assets to have easy access to at all time will ensure that the company has cash in case of emergencies. Entrepreneurs that establish a policy for net working capital can form a goal for the cash balance of their small business on a continuous basis (Ross, 94).

Financial planning will maximize a company's financial potential by examining linkages between proposed investments and available financing, exploring financing options, avoiding unwanted surprises, and ensuring specific areas of a company's operations are feasible and internal consistency (Ross, 94-95). The linkages between proposed investments and available financing can be made by starting a bike rental service and as customers rent bikes using the revenue to finance the cost of the bikes. A financial plan will allow a company to explore financing options such as stocks, bonds, and loans. Like mentioned before, incorporating a net working capital policy into the company's financial structure is one way to avoid unwanted surprises. Highlighting financial planning in finance courses will entice students with entrepreneurial interests to take finance courses. It is important to demonstrate the application of financial planning and of financial concepts to entrepreneurship in syllabi to appeal to students with interests in starting their own business.

Finance For Entrepreneurs.

While researching the topic of this paper, I have found curricula about finance that tailor to entrepreneurship such as, "Entrepreneurial Fi-

nance." Entrepreneurial finance refers to the "financial aspects of entrepreneurship" and as such, it deals with funding and financial management issues that are relevant to new and growing businesses ventures (Macht, 985). Apparently, there is a market for students interested in knowing finance principles that will specifically aid in entrepreneurship. It is becoming increasingly important that entrepreneurs know the fundamentals of structuring finances for their business. Identifying the finance curriculum for entrepreneurship will establish direct connections between finance coursework and entrepreneurship. As courses like these gain public attention and become available in more colleges and universities, perceptions of finance will change and attract more students, more specifically students who are interested in entrepreneurship.

Entrepreneur finance is focused on the new and growing (and therefore small) ventures that distinguish entrepreneurial finance from CF, which deals with large, established corporations (Macht, 985). It is also important to note that Entrepreneurial finance is somewhere in between entrepreneurship and corporate finance. Corporate finance contains valuable information to small business owners. Having the knowledge of large established companies will aid the preparation of small business entrepreneurship because the history of an established and successful business will lay a roadmap of how to make financial decisions and avoid financial mistakes. In fact, within corporate finance textbooks are sections about how the concepts discussed can be applied to small business. However, the sections that talk about small business are very small, and in the syllabi of corporate finance courses there is little to zero mention of its application to small businesses. There are even curricula and certifications for entrepreneurship that do not include finance courses at all. For example, the certificate of entrepreneurship offered at the University of West Georgia has course requirements that include various management courses but there are zero finance courses listed. The creation of curricula that is specifically for entrepreneurship that discusses corporate finance is an excellent solution.

RESULTS

The study of finance will provide a basis for the structure of a company's financial policy. A company's financial policy consists of these basic elements: capital budgeting policy, capital structure policy, dividend policy, net working capital policy. Capital budgeting decisions address all needed investments in new assets (Ross, 92). Capital structure policy addresses the degree of financial leverage to finance its investments in real assets (Ross, 92). Dividend policy addresses the amount of cash to pay shareholders (Ross, 92). Net working capital decision addresses the amount of liquidity and working capital needed on an ongoing basis (Ross, 92). Since this information came from a corporate finance textbook, some of it may not be ap-

plicable to entrepreneurs immediately. As the company grows, the company will require more options for financing and this financial knowledge will be useful.

While taking the finance course, students will learn about multiple tools that entrepreneurs will benefit from. Based on the goals that an entrepreneur wants to achieve, they will need to develop long-term and short-term financial plans. A student can implement knowledge about the capital budgeting policy to structure long-term and short-term financial plans. It is important for entrepreneurs to develop optimal capital structure. This is because doing so will result in lowest weighted average cost of capital (WACC). Establishing the optimal capital structure for the specific goals of the company will be a tool that entrepreneurs can plan to implement from the start of the company. If the company decides to go public and sell shares of stock or stay private will be decisions that will be made further in the future for entrepreneurs. Having adequate knowledge about dividend policy will eventually aid in making necessary and appropriate dividend payments. Information about networking capital policy can be used to determine target cash balance for a small business on a continuous basis. Small business valuation for acquisition purposes is a great tool for entrepreneurs that they will want to know in the future. Entrepreneurs can also learn how to determine the valuation for lease-or-buying decisions. This is great information to know early in the development of the business because it will justify the leasing or buying of assets to optimize their value.

CONCLUSION

Despite the lack of entrepreneurial interest by finance majors, there is interest in finance by students in pursuit of entrepreneurship. Meaning that pursuit of a finance degree may not be the best option for aspiring entrepreneurs. However, there are other ways to acquire sufficient financial education without the pursuit of a degree in finance. This is why there are certifications, and specified courses that are tailored to students that will find the course useful and applicable to entrepreneurship. However, courses for entrepreneurship about finance are generally new so they have not been implemented in curricula for many schools yet. Also, the current entrepreneurship certificate requirements seldom include finance courses.

The solution lies in how the application of finance is communicated to the students. Entrepreneur Finance is a step in the right direction because students interested in entrepreneurship know instantly that they will acquire the financial education relevant for their careers. Another solution is that course syllabi for corporate finance courses specifically can include information about how the key concepts are applicable to entrepreneurship. This will engage students from other disciplines and students who may only want to take certain courses for their own self interest instead of taking them to

satisfy specific degree requirements. Finance curriculum from post-secondary institutions will provide detailed, relevant, crucial information for entrepreneurs to achieve their long-term and short-term financial goals.

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FALL 2021

GILMORE GIRLS:
TELEVISION AS A SOCIAL MIRROR

Television has become not only increasingly prevalent in our society, but it has also begun to function as a mirror for our cultural traditions and attitudes as well as the social movements and conversations taking place in our society. It also has the potential not only to educate viewers but also to present new ideologies and attitudes towards social issues that have either not been discussed enough or have been ignored altogether. Television is able to reshape our thinking or force us, as viewers, to draw our own conclusions and formulate our own opinions regarding social issues and controversies. Because it functions as a social mirror, television allows us to understand the realities of people with whom we may otherwise not encounter in our daily lives. In other words, television has both the ability to educate viewers to promote acceptance of all people, regardless of ethnicity, class status, and gender while at the same time having the potential to trade in stereotypes that prevent that acceptance. Such inclusion coincides with the sense of belonging that arises from watching television, which, in turn, provides the opportunity for television to become a substitute for building and maintaining relationships in real life.

Gilmore Girls is one of the many television series that capitalize on ethnicity, class status, and gender to depict a complex world with a society that is familiar to us, granting us both the luxury of escaping from our own realities and the ability to regard television as a positive social influence. The series spanned from 2000-2007 and relied on the collision of social spheres as well as the interpersonal relationships depicted to create both tension and a relatability that fuels the show and allows it to develop into a "seven season, 153-episode, approximately 107-hour narrative" (Lavery 6). In 2016, *Gilmore Girls: A Year in the Life* debuted, rebooting the show in four episodes, one for each season of the year to offer a broad resolution to the world so many viewers fell in love with. This article will focus on *Gilmore*

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Girls, although it is also possible to track social progression between the original series and the reboot to see how television adheres to the norms of the society relative to the timing of its creation. Scholars have studied *Gilmore Girls* through a feminist lens and as an American Dream narrative, but less research has been conducted regarding how society impacted the construction of the show. To study this relationship, I will first consider the show's depictions of ethnicity before analyzing the way the show depicts class status and gender. By looking at how these categories bear out in specific episodic scenes, we can see how *Gilmore Girls* reinforces the idea that entertainment mirrors society, which is important because it reverses the negative stigma surrounding television while also empowering female viewers to challenge social standards.

SYNOPSIS OF *GILMORE GIRLS*

To examine the categories through which society influences *Gilmore Girls*, it is important to first have a detailed synopsis of the show. The bildungsroman drama is set in the fictional town of Stars Hollow, Connecticut, and focuses on the best-friend-like relationship between a single mother, Lorelai Gilmore, and her sixteen-year-old daughter, Rory. It shows their life in the small town as well as the contrast between their social class and that of Lorelai's parents, Richard and Emily Gilmore. The show tracks their relationship as Rory enters high school and prematurely prepares for attending an ivy league university, a financial liability that leads Lorelai to return to her estranged parents. Their financial arrangement creates a codependency between the Gilmores that causes Lorelai and Rory to suddenly bear out their lives in a mixture of two separate spheres: (1) their own stereotypical small town of Stars Hollow and (2) the stereotypical wealthy and prestigious world of Hartford in which Richard and Emily

reside. The series spans Rory's collegiate years and ends with her graduating from Yale University and beginning a job as a reporter on Barack Obama's campaign trail.

LITERATURE REVIEW

Scholars have also conducted extensive research regarding the implications of television addiction for both the individual viewer as well as the society comprised of these addicted individuals, and the findings have been overwhelmingly negative. Young children and adolescents suffer the most from consuming an increasing amount of content at a much quicker pace than previous generations. Bianca-Marina Mitu calls this "television hypnosis" and identifies children as "victims" of shortened attention spans, weakened language skills, and weakened memories, all of which create difficulties focusing in academic and, later on, professional settings (917).

Still, our society can benefit greatly from the prevalence of television, as Ivan Askwith, a graduate of Massachusetts Institute of Technology's Comparative Media Studies program, points out in his thesis on the logics of entertainment. Among his list of positive outcomes are:

> (1) gaining insight into circumstances of others; (2) identifying with others and gaining a sense of belonging; (3) finding a basis for conversation and social interaction; (4) having a substitute for real-life companionship; (5) helping to carry out social roles; and (6) enabling one to connect with family, friends, and society. (Askwith 103)

Looking into characters' lives, whether fictional or inspired by true events, forces viewers to subconsciously notice differences between themselves and the figures on-screen. Many viewers regard television as simply a source of escapism, but repetitive consumption of these diverse characters and their worlds have allowed us to embrace the unique identities of others.

Fans of television shows connect over their shared interest in a particular show and form fandoms that foster an atmosphere focused on the show's implications and themes. Series enthusiasts often take to social media platforms, particularly Twitter, to voice their opinions and listen to those of others, thus creating conversations about the show's depiction of social issues. Laurena Bernabo, an assistant professor at the University of Iowa, even argues that the significance of entertainment lies in the fact that it actually critiques widely popular social movements to afford viewers moments of self-reflection. She conducted a study to evaluate the Twitter conversations surrounding television shows, including *Law & Order: SVU*, *The Good Wife*, and *Scandal*. The results showed that such television shows that err on the side of realism are more likely to reflect social issues and, therefore, will be scrutinized by viewers for their appropriate or inappropriate use and timing of dramatization. These Twitter critiques often extend into

larger conversations about divisive social, systemic, or political issues that allow us to expose a social weakness or flaw that has long been unnoticed or ignored. Sometimes the Twitter storms turn into debates or even fights amongst users (Bernabo). Even though these sour interactions add tension and can potentially distract from conversations that are geared toward well-intended change, television does good in the world.

Because television legitimizes the culture from which it is produced, the lens of our society is simply inescapable. This means that while television attempts to represent the problems that society struggles with understanding and making sense of, it can also be laced with unfair and unequal representation of minorities. Donald Diefenback and Mark West, two English professors at the University of North Carolina, bring up this valid point in an article that discusses how "television has perpetuated many stereotypes throughout its history, including unrealistic portrayals of racial groups...and gender roles (Diefenbach and West 181). The reinforcement of such stereotypes and binaries not only robs viewers of the opportunity to form their own opinions, but it also interferes with our ability to understand and accept people who may be different from us in some way.

Occasional viewers, however, are less likely to grasp the larger implications of the series if they have watched the episodes in a non-sequential order. This inconsistent viewing yields complications in dissecting the ways in which a television show is constructed in order to convey themes or relay messages. Streaming platforms allow viewers to binge watch television shows, letting them decide how much time they would like to wait before continuing on in the story arc since they are no longer at the mercy of the television channel's set schedule. Without taking the time necessary to process the content and internalize the messages found within the episodes watched, it becomes much harder to grasp the larger implications of the series.

PRE-EXISTING RESEARCH ON *GILMORE GIRLS*

Scholars and critics alike have studied *Gilmore Girls* in order to better understand the series as a feminist text. McKenna Ahlgren focuses her thesis on how the three generations of Gilmore women align with the three waves of feminism, respectively. Emily represents First-wave feminism, as evidenced by her desire to maintain agency and autonomy in her marriage to Richard, while Lorelai's career progression from maid to eventual inn owner reflects Second-wave feminism. This leaves Rory to embody Third-wave feminism, a blend of the two previous waves that allows freedom to forge a self-pleasing lifestyle. Ahlgren attributes Rory's self-determining attitude to "Lorelai's acceptance of [her], regardless of the life she leads" (Ahlgren 25). While their strong mother-daughter bond is really a deep-rooted friendship that Emily and Lorelai never shared, it is the blending of Rory's upbringing,

societal norms and values, as well as personal standards, that influence her alignment with Third-wave feminism. The divergence of both Emily and Lorelai's respective waves free her from the need to adhere strictly to either wave.

  Gilmore Girls has also been studied as an American dream narrative. Anna Sborgi considers Lorelai "a symbol of self-reliance and is determined to ensure that her daughter—with as little support from her own parents as possible—has educational and professional opportunities made available to her" (Sborgi 186-187). Lorelai's network of helpers, which consists of her parents and Luke, a diner owner in Stars Hollow, challenge her financial independence and self-sufficiency by offering the finances for Rory to attend private school and, later on, Yale as well as for Lorelai to build her own inn. Without this financial backing, the duo's American dream would not have become reality (Detmering). Financial dependence aside, the entire town of Stars Hollow has supported the couple in ways that Emily and Richard have not, at least for quite some years, and has "functioned as a womblike [*sic*] environment … that has sustained yet also sheltered" Lorelai and Rory (Buckman 130). The charisma and closeness of the town as well as the emotional support provided by close friends and neighbors have fostered the mother-daughter relationship and prepared Rory for adult life beyond the town limits.

HOW *GILMORE GIRLS* IS INFLUENCED BY SOCIETY

  Following a synopsis of the show and prior research regarding it, it is now time to examine the series through three different lenses to better understand the social connections to and implications of *Gilmore Girls*.

Ethnicity

  Stars Hollow is an overwhelmingly white town, and the very few non-white characters are depicted in stereotypical ways. Among the non-white secondary characters are Gypsy, Michel, Mr. and Mrs. Kim and their daughter, Lane. These characters represent a variety of ethnicities, with Gypsy being a Lebanese mechanic, Michel being the French concierge at the inn, and the Kim's being Lorelai and Rory's Korean family friends. Because Mrs. Kim and Lane are the main characters among this list, they will be the focus for the remainder of this section.

  Mrs. Kim is a stereotypical strict Korean mom who is controlling to ensure that she fulfills her motherly duty of educating Lane about her Korean roots and equipping her to continue the cycle for future generations. In "A Deep-Fried Korean Thanksgiving," the Gilmores experience Mrs. Kim's dictator-like character while visiting the home for the holiday. Upon opening the door, Lorelai hands Mrs. Kim flowers, a can of cranberry sauce, and a chocolate turkey, the latter of which sparks the following exchange:

Mrs. Kim: "What should I do with this?"
Lorelai: "Oh, I don't know. Let the kids share it."
Mrs. Kim: "And then send a blank check to their dentists?"
Lorelai: "They don't have to eat it. They could play with it."
Mrs. Kim: "Play with the chocolate? It's missing its head."
(00:16:03 - 00:16:35)

Mrs. Kim's forbiddance of chocolate and other American foods can be seen all throughout the series, as evidenced by Lane's constant binging of sugary foods, salty fries, and pizza crusts only when at Luke's Diner or with Lorelai and Rory. Mrs. Kim's rejection of American foods like the festive chocolate turkey function to not only develop her as a stern Korean mother, but it also functions as a window into Lane's restrictive lifestyle. Mrs. Kim's strictness frightens Lane into leading two lives to accommodate her complex identity. She indulges in American culture and carries herself as any other American teenager, but only with Lorelai and Rory. Because she is accustomed to code-switching to meet her mother's expectations, Lane exposes only her Korean life to her mom. Viewers empathize with Lane because of this duality, seeing her as a teenager denied the freedom of experiencing American culture to the fullest.

Mrs. Kim's disciplinary rule, while well-intended, adds tension to her and Lane's relationship, complicating the parent-child dynamic and ruining Lane's confidence in finding and defending her own identity among the parental pressures she experiences. In "One's Got Class and the Other One Dyes," for example, Lane attempts to inform her mother of her desire to pursue a career in music (00:11:23-00:13:08). She fears, though, Mrs. Kim will "start waving a crucifix" when she reveals her passion for music and confesses to being a drummer in a band without Mrs. Kim's consent (00:07:42-00:07:43). She gives herself a pep talk on her way to talk to her mother, reminding herself that Mrs. Kim is "[her] mother and she wants [her] to be happy on some level," but she follows this up with: "I think. Maybe not" (00:11:46-00:11:50). This quick scene exposes Lane's doubt regarding her mother's care for her happiness, which causes viewers to empathize with her situation. Her doubt seems to be proven when Mrs. Kim cuts her off mid-sentence and makes her sit down at the table while she pours tea. The height and spatial differences in this arrangement also work to quiet Lane and encourage submission. Not only does Mrs. Kim's dominance strip Lane of the confidence to claim ownership over her future, but her obsession with Lane completing college applications approved by Reverend Mellmen functions to invalidate Lane's interest in music. Mrs. Kim goes a step further, though, by highlighting the "good religious programs" and applauding herself for vetting out the "party schools" that allow boys and girls to mingle in common areas (00:12:46-00:12:53). Comments such as

these discourage Lane from wanting to include her mother in her life and dreams. Mrs. Kim's help on these applications has turned into her filling them out for Lane, creating both a feeling of insufficiency and sense of disappointment for wanting to stray from Mrs. Kim's religious expectations.

Depicting her confusion and feelings of isolation and marginalization not only paints Lane as a submissive subject gripped by psychological trauma, but it also establishes the context to support her retaliation and discarding of her Korean identity molded by Mrs. Kim's standards. After being silenced yet again by her mother, Lane vents to Rory: "I've spent my whole life compromising and being the good little girl and not doing what I want or doing what I want and hiding it and feeling guilty for doing it, and I'm sick of it" (00:16:09-00:16:17). Enraged, she enlists Rory's help dying her hair purple, calling this her "Independence Day" (00:18:21-00:18:22). Lane claims no fear of her mother's response and tells Rory she will not wear a hood to conceal the change. She undergoes this transformation as a desperate attempt to dissociate her life choices and identity from pleasing Mrs. Kim's wishes, only to decide "it was just too big of a statement" (00:38:47-00:38:48). Out of fear for the punishment that is sure to come, she retracts her audacious action and dyes her hair back to black before Mrs. Kim can notice. This rebellion, although temporary, allows Lane to flex her independence and power in the harsh Korean household.

Lane has an interesting strategy for coping with the constant code-switching that has arisen due to her strained relationship with her mother. Because the tight grip is insufferable, Lane has constructed in her mind a difference between fibbing and lying. Telling a lie causes a "feeling in [her] gut like a wild animal is burrowing into it," while fibbing, on the other hand, does not cause her any feelings of guilt (00:01:53-00:01:55). With fibbing, she achieves the same level of innocence as she would have by simply telling the truth. While Mrs. Kim expects Lane to value religion and abide by conservative Korean practices, Lane is "*dualistic:* a rock-obsessed, all-American teenager who has to pass as an obedient 'Korean' daughter in the presence of her hymn-loving, Bible-toting" parents (Chung 166). Because Lane's idealistic character, as sculpted by Mrs. Kim, and Lane's realistic self do not align, there is a gap between the desired and possessed identities that creates a complicated identity crisis for Lane. To cope with this identity issue, she capitalizes on the self-identified difference between lying and fibbing to justify how her American self and Korean self can peacefully coexist in her conscience.

Class Status

Somewhat similarly, class differences add familial tension to Emily and Lorelai's mother-daughter relationship while also complicating Rory's relationship with both her grandparents and her mother. These

class differences are "in relation to occupation (e.g., manual or service, management or ownership), education, and lifestyle or taste (including how one spends income)" (Mastrocola 4). While financial stability is one of the most obvious factors in determining which class one is a member of, one's occupation as well as the number and prestige of collegiate degrees they hold play a role in affecting social status, too. Lifestyle preferences relating to materialistic tastes are also important to both the definition of class as well as to the show, considering that the amount of money one spends and the things which they choose to spend money on can be observed as indicators of priorities.

Stark differences in all of those areas exist between the elite society that Emily and Richard belong to and the middle-class status of Lorelai and Rory. Richard's white-collar work in the insurance business causes him to take several leaves of absence during the course of the series to visit international business partners. Even during retirement, he takes an economics lecturing position at Yale, staying in the realm of intellectual work as opposed to strenuous manual labor. Meanwhile, Emily's only job is to maintain her social status by participating in and contributing to several upper-class organizations. She is an active member of the Daughters of the American Revolution (DAR) and is also involved with several charities. Her primary duty is to host functions on behalf of the organizations, which classifies her as a social figurehead. Both Gilmores were college educated, with Richard attending Yale University and Emily studying history at Smith College. Both their education and occupations create a lofty lifestyle that contrasts with that of Lorelai and, consequently, Rory. Lorelai's life took a different path when she became pregnant with Rory at sixteen. Because of her teenage pregnancy, Lorelai moved out of the Gilmore house so that she could raise Rory without constantly being scrutinized under the critical eyes of her parents. When she arrives in Stars Hollow, Mia Bass, the owner of the Independence Inn, employs her as a maid. Rather than immediately attend college, Lorelai works her way up to manager of the inn and eventually becomes the co-owner of the Dragonfly Inn. Her devotion and entrepreneurship establish her as the only Gilmore to make a living by working both a blue-collar and white-collar job, but this professional advancement does not grant her the ability to spoil Rory with materialistic things. Because their financial situation is too strained to allow for such frivolous spending and traveling, the two rely on Stars Hollow gatherings and traditions to fill their free time.

One of the many episodes that depicts the Gilmore's exclusivity is "Ted Koppel's Big Night Out." In this episode, Richard and Emily tailgate at the Yale-Harvard football game (00:19:34-00:23:25, 00:25:48-00:33:18). The disproportionate size of their RV in addition to their catering-like set-

up immediately elevate the Gilmores above the other tailgaters, who mark their spots with mediocre pop-up tents and literal tailgates. The Gilmore tailgating experience consists of steaks prepared on-site by the family's personal chef and Bloody Marys. A maid is also on-site, responsible for perfecting the fabric tablecloths, floral arrangements, and food displays. She also serves the family throughout the event and cleans up during the football game. The whole arrangement carries a near-identical atmosphere of their Friday night dinners but with an outside setting compared to the formal dining room in which they usually eat. Richard and Emily's inability and unwillingness to scale back their upper-class expectations make it clear that they regard tailgating as a social event that offers them an opportunity to flaunt their success. Talking to strangers without an agenda is even considered "[harassment]" in Emily's eyes (00:19:48-00:19:49). Others, however, view tailgating as simply a less formal bonding experience for the purpose of building community and reuniting alums. These tailgaters hold beers, some in glass bottles and some poured into plastic cups, while they slave over the grill preparing their own food. This dichotomy in both presentation and interpretation of the event's purpose functions to elevate the Gilmores to a higher level of status and sophistication than all of the other people in attendance.

The class difference between Hartford and Stars Hollow is further accentuated by comparing Rory's two birthday parties. The sixteenth birthday party that Emily throws Rory is a black-tie affair, complete with cocktails and hors d'oeuvres that are so elegant they are unrecognizable and smell unappealing to Rory ("Rory's Birthday Parties" 00:17:38-00:23:31). This party is an elegant social production, which fits Emily's modus operandi as an over-the-top hostess. Not only are Rory's classmates less-than-thrilled to attend "another obligation party" forced upon them by their parents, but most of the non-Chilton guests are strangers to Rory (00:08:34-00:08:35). For Richard and Emily, this party is not only an expression of their newfound involvement in Rory's life, but it is also an exciting opportunity for them to introduce Rory to Hartford society, an opportunity that they would have had with Lorelai if not for the embarrassment and shame of her teenage pregnancy. This social agenda is clearly evidenced by Richard's excitement to talk business at the party with men who make no effort to hide their lack of interest in the birthday girl. Instead of making cordial small talk with her, the men apathetically hand her their envelopes as if they are fulfilling a duty before they head to Richard's office to resume their business discussion. Rory dislikes the formality of the party and becomes overwhelmed at Emily's instruction to give a speech, at which point she bites back that Emily is the hostess. To exonerate herself of any responsibility for Rory's behaviors, Emily says, "Lorelai, your daughter has no manners whatsoever. You should

be ashamed of yourself" (00:23:27-00:23:31). The party concludes with hurt feelings and tensions still high.

In comparison, the party that Lorelai throws is much more relaxed and enjoyable for Rory. This "Stars Hollow extravaganza" consists of members from the town as well as Rory's friends (00:04:10-00:04:12, 00:32:00-00:41:49). Its casual atmosphere is evidenced by the lack of a dress code, as both the hostess and birthday girl sport casual clothes compared to cocktail dresses. Rory even sports a feather boa and "Happy Birthday" tiara. The food, which is catered by Sookie, the chef at the Independence Inn, pleases both the clients and guests and surpasses even Emily's expectations. The cake with a picture of Rory's face on it is also a hit among the crowd, and it is important to note that there are no complaints about the paper goods. The people of Stars Hollow, or "an assortment of characters" according to Emily, clearly know how to enjoy a birthday party, as it is nothing but smiles and laughs (00:38:37-00:38:38). The group is even obliged to partake in birthday party traditions such as singing "Happy Birthday" and watching Rory blow out the candles on the cake and open gifts. Rory's smile does not waver upon Richard and Emily's arrival, despite being told they were busy with other arrangements on that Saturday. The Gilmores' presence adds stress on Lorelai, however, since it is the first time her parents have visited her home. While Richard deems the fireplace a structural hazard and then spends his time on the porch reading, Emily takes it upon herself to explore the house and in doing so finds a picture of Lorelai with a cast on her leg. This discovery emphasizes to Emily just how absent she has been from Lorelai's life. In fact, she gets in the car and admits to Richard that Lorelai "is right" because she "[doesn't] know her daughter at all" (00:42:00-00:42:03). At the Stars Hollow party, Rory is able to simply enjoy the celebration and disregard the drama. Because of the ease and enjoyment of the night, Rory prefers the party hosted by her mom, which, in turn, expresses a comfortability and confidence in aligning herself with Lorelai's middle-class status.

Still, the collision between the two class differences exposes Rory to the upper-class world of entitlement and exclusivity that Lorelai ran away from, which allows her to grow closer to her mother as a result of this understanding and also choose which social sphere she prefers to identify with. She is in an interesting position as "the only character who can effectively function in both" Hartford and Stars Hollow (Nelson 203). Time and time again, Rory manages to keep one foot in Stars Hollow and one foot in Hartford by meshing both the atmosphere and expectations of her hometown with those of the upper-class lifestyle that Richard and Emily belong to. In fact, Rory functions as the peacekeeper throughout the show, making "constant efforts to heal old wounds and bring family members together again" (Sborgi 200-201). She is an impartial yet directly

involved third-party in Emily and Lorelai's relationship in that she maturely approaches their estrangement while also being personally vested in their reunion and healing process. This oftentimes makes Rory the most relationally mature character in the Gilmore family, besides Richard who also serves as a mediator between Emily and Lorelai.

In addition, Emily and Lorelai's estranged relationship, which largely stems from the generational alignment with different social classes, impacts who Rory is as well as her role in the show. Rory wants to see their relationship improve, and because of this, she submits to many of Emily's demands, which Emily poses in a way to imply that they have a choice in the matter, when in actuality she has already made the decision and will not be convinced otherwise. This tactic allows them to retain their feeling autonomous in the Hartford world. In many of these situations, simply the idea of disappointing Emily is enough for Rory to agree to something, no matter how ridiculous or unwanted the demand is. For example, in "Rory's Birthday Parties," Emily is adamant about throwing Rory a birthday party on her birthday, which falls on a Friday (00:03:06-00:04:00). Although Lorelai objects to the date and begs Emily to move the party to Saturday so that she can throw Rory's party on Friday, Emily refuses to budge. Rory is clearly upset about having to spend her birthday in Hartford and becomes more upset that the guest list consists of the arrogant Chilton classmates with whom she has not connected. Having no say in the matter, though, she submits to Emily's demand for the Friday party.

In fact, Rory's peacemaker nature is underscored by her decision to conceal her emotions in a situation in which it is completely reasonable to be upset, which demonstrates a level of maturity and care for others that has been fostered by the familial feuds for a long time. In preparation for the party, Emily invites Lorelai to go birthday shopping with her to help her get Rory a present she will like, which comes as a pleasant surprise to Lorelai (00:07:00-00:07:54, 00:08:39-00:11:02). When that shopping excursion does not entail a fight or end on a sour note, Rory becomes just as happy as Lorelai about the bonding experience. She is so pleased that their relationship might be improving because of this party that she conceals just how much she is dreading it. She also hides her anger and embarrassment over the party from Lorelai because she interprets their trip's peaceful ending as a step forward towards healing and reconciliation. Still, she is angry that she learns from Tristan, one of her arrogant Chilton classmates, that all of her classmates were invited to her party. She also becomes angry at her grandmother because she did not ask for her permission or opinion about the guest list nor find out about the expansive invite list from Emily herself. Her pent-up stress, anger, and embarrassment regarding the consequential bullying she receives from her classmates because of the obligatory party

manifests into a string of heated remarks directed to Emily in front of all of the guests. She then runs upstairs to escape the intense pressures of the party and tells Lorelai that she bottled up her feelings because Lorelai "[was] happy" and she "didn't want to screw everything up" (00:24:17-00:24:24). Keeping peace is a big responsibility for a sixteen-year-old girl, and the fact that she subjects herself to this position on her birthday highlights her maturity, which might not be as developed if not for the class differences between Emily and Lorelai establishing Rory as a middle-woman.

Gender

Gilmore Girls reinforces the traditional gender binary of male and female, making clear, accurate associations for what society accepts as masculine and feminine. This gender binary is evidenced by considering the dichotomy of Rory's birthday parties again, but from a gender perspective this time. The party that Emily throws for Rory seems to be genderless, in that it avoids an excessive amount of color, decorations, or foods that announce or affirm Rory's gender. The fancy fabric of the drapes, pieces of polished wood furniture that appear to be mahogany, and various paintings set the backdrop for the party. Wealth is the only color present at this black-tie optional party. Lorelai's party for Rory, however, is much more relaxed both in atmosphere and presentation. It is much girlier, with Rory sporting a pink feather boa and gold "Happy Birthday" tiara. Guests eat and drink from pink paper goods, and the cake even has a picture of Rory's face on it ("Rory's Birthday Parties"). The fact that pink is an indication of femininity is just one association that is reinforced from a young age.

More than that, this gender binary takes hold of the Stars Hollow residents and suggests a generational continuation of such associations, which encourages members of society to abide by the social standards set for them and leaves little room for social change. In the very first episode of the series, a throng of girls in pink tight-fitting leotards and dresses take baton lessons to prepare for a Thanksgiving parade ("The Lorelai's First Day at Chilton" 00:17:15-00:17:38). Miss Patty, the dance studio owner, leads the girls in their lessons, encouraging them to picture themselves "out in front with [their] fabulous legs and [their] perfect [tushes]" (00:17:26-00:17:35). In addition to reinforcing the physical standards expected of girls, she projects these expectations on her young students. She sets them up for their performance with the mentality that they need to meet particular body standards, instead of encouraging them to enjoy their time in the spotlight, which is the only reasonable and fair expectation for young children. She even goes a step further, though, to make the girls into trophies, visualizing that "[their batons are] on fire and the crowd goes nuts!" (00:17:31-00:17:35). In picturing them impressing the crowd, she glorifies them, placing them on pedestals as figures of public admiration and satisfaction. Although not

directly sexualizing them, she does speak of them as sexualized or idolized poster children for the entertainment and joy of the crowd, which shows her prioritization of society's response and opinion.

Because the show is focused on female protagonists, it places less emphasis on creating masculine associations, although the show does rely on Lorelai and Rory's viewpoint of the hobbies that the most prominent men in the show, Luke and Richard, take up, associating activities more so than other materialistic things as belonging to the classification of masculinity. For example, Luke is a man who loves the outdoors and enjoys taking weekend trips to camp and fish. When Lorelai takes up an interest in fishing to impress her then-boyfriend, Alex Lesman, Luke offers to teach her the basics ("Lorelai Out of Water" 00:25:54-00:30:00). He sets up a kiddie pool in her front yard and dumps a bucket of trout in the water, treating the small-scale lake as a controlled environment. Before giving Luke the opportunity to teach her anything about fishing, Lorelai names each fish, even naming one Pinky after a girl from fourth grade whose "eyes [darted] back and forth, all panicked" after playing dodgeball (00:26:42-00:26:47). At this point, Luke doubts her ability to actually learn how to fish since the act of catching one entails a bloody reality for which her empathetic self is not ready. Still, he introduces her to the fishing pole and reel, even explaining how the bail is responsible for keeping the spool of line intact. After coaching her on how to hold the pole and properly cast it, she successfully lands her line in the kiddie pool and is incredibly proud. Still, her experience learning to fish is utopian in that the hook remains covered by a cork the entire time. Even when Luke grabs a fishing pole whose hook is not covered by a cork, she asks for him to put a cork on that hook, too, as "one more favor" to her (00:29:53-00:29:54). In casting without also experiencing the possibility of hooking a fish, Lorelai expresses a disinterest in actually fishing. As evidenced by this example, physical skills can be taught to a woman, but it is much harder, if not impossible, to teach the mental toughness needed to approach activities and situations with logic rather than empathy. Doing so requires an interest and lengthy commitment on the woman's part to dabble into what society deems masculine hobbies and sources of entertainment.

Gilmore Girls goes a step further in its gender discussion, though, by also discussing the social roles expected of men and women in society as a result of the gender binary previously described. Lorelai makes a blatant declaration of these roles when talking to Luke after they have dinner with her parents. She admits that "[she wishes she] had a partner. Someone to pick up the slack, someone to, uh, wait for the cable guy, make [her] coffee in the morning" ("The Incredible Sinking Lorelais" 00:20:55-00:41:03). These are the expectations that Lorelai has for her partner, and based on her romantic journey throughout the show, we know that Lorelai

is a heterosexual woman, which means she expects the man with whom she enters into a romantic relationship to be able to fulfill these expectations. Ultimately, these expectations are filled by Luke as the two eventually get married, which came as no surprise to many viewers considering the show relies on its portrayal of Luke as a loyal friend to subconsciously 'ship' the couple from the very beginning so that viewers root for them to enter into a romantic relationship. Painting Luke as the one guy out of all of Lorelai's love interests and the Stars Hollow men to take care of Lorelai and Rory's needs and wants also casts him as their hero. He offers his physical labor and monetary support as well as lends other various belongings for a myriad of reasons over the course of the show, including fulfilling maintenance needs at their house and assisting with Rory moving into her dorm at Yale. In turn, depicting this agape or self-sacrificial type of love that Luke has for the two casts the girls as damsels in distress.

      In terms of what role women should play in society, Dean, Rory's then-boyfriend, sparks this conversation when he reveals his desire for a relationship centered around traditional gender roles. The debate begins one night over pizza, soda, and an episode of *The Donna Reed Show*. Lorelai and Rory quickly educate Dean on who Donna Reed is, constructing a teamwork definition of her as "the quintessential '50s mom with the perfect '50s family, never without a smile and high heels, hair that, if you hit it with a hammer, would crack" ("That Damn Donna Reed" 00:00:32-00:00:38). Rory's main complaint about the idea surrounding Donna Reed is "that her one point in life is to serve somebody else," which they even go so far as to regard as a "lifestyle" and "religion" (00:11:33-00:11:36, 00:00:40-00:00:42). They poke fun at the idea of a conventional marriage by subbing their own dialogue over the characters' actual conversations (00:01:22-00:01:44). Their mockery seems to offend Dean, who admits that "it all seems kind of nice" to him (00:01:48-00:01:49). Rory snaps back at him, asking what sounds nice, while Lorelai cuts her eyes at him. Their facial expressions suggest a mixture of irritation and confusion. He argues that Donna seems happy to be fulfilling domestic responsibilities around the house, but Lorelai informs him that she takes medication to deal with her husband and his demands. Coincidentally, the crux of the episode they share this conversation over focuses on a husband who comes home from dinner without calling first to give his wife notice. This on-screen situation later proves ironic, as the opposite bears true when Dean misses dinner and fails to call home to Lindsay after sleeping with Rory.

      This conversation about a woman's obligation to be an obedient wife leads Rory to second-guess the future of their relationship and Lorelai to reconsider if Dean is a fitting partner for Rory. Through Rory's attempts to understand if living a Donna Reed life would interfere with her self-

satisfaction, *Gilmore Girls* challenges and rejects the socially accepted standards for what responsibilities and social role a woman should have. To experiment with these traditional roles, Rory adopts the antiquated identity by hosting a mock evening as a married woman. She greets Dean on the porch with "Honey, you're home," clad in an orange gingham dress with a modest neckline and full skirt (00:24:11-00:24:13). Rory completely adopts the Donna Reed aesthetic, evidenced by her matching heels, coordinating headband, and pearl jewelry. On this "Donna Reed night," Rory fixes steak, green beans, and mashed potatoes for dinner and also makes dessert (00:25:23-00:25:24). Rory goes a step further in adopting the expectations of this idealistic woman by declining Dean's help cleaning up the dishes after dinner. In return, he says that "as the man, [he] will do what the man is supposed to do...take out the trash" (00:28:59-00:29:04). This acknowledgment of masculine duties demonstrates Dean's awareness of gender expectations. The initial disagreement about the appeal of a traditional marriage seems to divide the couple and threaten the possibility of long-term happiness with one another, but Rory actually has fun pretending to be Donna Reed, who, after research, is discovered to be "one of the first woman television executives" (00:28:33-00:28:34). In addition to the historical contribution that is the cause of Rory's new-found liking of Donna Reed, this date night also results in Dean reassuring Rory: "I don't expect you to be Donna Reed. And I don't want you to be Donna Reed" (00:28:03-00:28:06). He either seems to have a change of heart regarding the progression of gender expectations for women, although that seems unlikely considering Dean's resolution, or is fearful that his desire caused Rory to change.

Rory's rejection of housewifery sets out to encourage young female viewers to follow in her footsteps by forging a path for freedom and individuality like Rory did by breaking up with Dean. Depicting Dean and Lindsay's marital problems presents Rory's life as being of higher quality than that of Lindsay's due to Dean's inability to shake his infatuation with an obedient and domestic wife. The couple marry at eighteen, with Lindsay becoming Dean's ideal wife and granting him the antiquated marriage that he sought after. She takes cooking lessons from her mother, keeps a tidy house, and learns to stay relatively distant from Dean's personal business. In "Say Goodbye to Daisy Miller," after Lindsay has failed to correctly cook Dean's favorite meal, roast beef, she revisits the butcher shop to reflect on what she did that made the roast beef imperfect. Based on her frustration, it is presumed that Dean expressed anger over the mistake, which would, in turn, serve as at least partial motivation for her desire to learn how to cook well. After confirming that she "put in three meat thermometers just in case one of them wasn't working" and followed the butcher's cooking instructions, she begs him to "just tell [her] again and write it down" ("Say

Goodbye to Daisy Miller" 00:33:40-00:33:43, 00:34:04-00:34:09). This dedication to perfecting roast beef represents her commitment to being the perfect wife. On the surface, her obsession with preparing roast beef stems from a desire to provide him with his favorite meal just as satisfactorily as his mother can, but she also wants to be able to recreate their wedding meal. Her desire to satisfy his physical hunger is partly done in hope that this satisfaction will overflow and bridge the gap of their physical intimacy that has been, unknowingly to Lindsay, interrupted by Rory and Dean's affair. As a result, Lindsay's battle to please Dean not only showcases housewifery as a domestic imprisonment, but it also portrays marriage as a relationship that always prioritizes the male's satisfaction above the female's enjoyment and happiness.

In addition to examining the way *Gilmore Girls* presents gender, it is also important to note that the Stars Hollow's predominantly heterosexual population remains largely untouched in the show's reboot, *Gilmore Girls: A Year in the Life*, although the reboot does make an effort to reflect current social conversations regarding gendered sexuality. In "Spring," Stars Hollow attempts to host their first annual gay pride parade only to find an underwhelming representation of homosexual individuals in the town. The town selectman, Taylor Doose, jokes about this shocking discovery and informs them: "I have contacted some of the mayors of neighboring towns to see if they would be willing to lend us some of *their* gays, but, uh, so far not a one has cooperated" ("Spring" 00:14:32-00:14:41). While the mere acknowledgement that sexualities aside from straight exist does suggest a bend toward acceptance, it does not excuse the humorous jokes made on these individuals' behalf. It is interesting that the creator of the show and its reboot, Amy Sherman-Palladino, as well as her creative team concern themselves with a reboot focused minorly on gendered sexuality inclusivity. The show simply hints towards inclusion rather than actually increasing the sexual diversity of characters, which would have been neither a hard feat or a source of confusion for viewers considering that almost a decade passed between the original show's final season and the beginning of the reboot.

Still, showcasing this gender revelation trumps a desire or need to increase other forms of diversity in the show such as racial or socio-economic diversity. By its reboot, Stars Hollow is very much an antiquated town that is too naive to recognize its own flaws and conservative views. In fact, the gay pride parade is presented as more of a necessity based on social context than a genuine desire to provide representation to a minority group. Doose argues that "2016 was the perfect year to hold it because it coincided with an important date, the 70th birthday of one Miss Liza Minnelli" ("Spring" 00:13:48-00:13:57). *Gilmore Girls* waited for society to respond to pop culture and advocate for the fluidity of gender before the show was willing

to consider adopting the social progression. Celebrating Minnelli's birthday called for a celebration of the gay people she champions, and in this way, the attempted pride parade seems like an honorary tribute rather than a genuine desire to celebrate members of society whose sexuality challenge the traditional binary asserted all throughout the original series.

CONCLUSION

Viewers of *Gilmore Girls*, while predominantly adolescent white females from middle to upper class society, are afforded the opportunity to learn a lot from the show by examining the way that it depicts multi-ethnic characters, a difference between middle- and upper- class members of society, and gender roles and expectations. The previous research that has been done on the show has proven how *Gilmore Girls* functions as a social mirror of the social movements and attitudes of American society, but in looking past the American dream narrative of the show, we see the show clearly mirror society in more specific ways. We see the Stars Hollow society struggle to cease ethnic stereotyping, normalize middle-class lifestyle, and reconsider the gender binary and its resultant roles. In studying this small town's society, we can see how *Gilmore Girls* attempts to educate viewers of social issues and biased attitudes. Depicting these social flaws grants viewers the opportunity to reflect on their own beliefs and biases so that they may make the necessary adjustments to foster social change and nurture a society that values individuality and freedom.

It is somewhat unclear, though, Sherman-Palladino intended for *Gilmore Girls* to function as such an accurate social mirror. She has been interviewed many times, and in one interview, admitted that Lorelai "expresses a lot of [her] yapping and opinions" and "is a nice vessel" for venting (Lavery 5). The show was very personal to her, partly because of Lorelai's character being an extension of her own self, but according to her, it "was often a 'show about nothing'—albeit a 'nothingness'" (Lavery 11). In another interview, she was asked whether or not she aimed to insert a particular message through the series. When questioned specifically about the lack of diversity in the series, she responded: "'I don't do message shows. I don't give a s*** who you learn your life from'" (Ahlgren 46). In claiming no intentionality to teach viewers how to live life, she relinquishes herself from the responsibility to offer a message along with the story arc and characters. This leaves viewers and critics with the impression that she simply does not care about the audience of *Gilmore Girls*, nor does she want to hear anecdotes about the life lessons they learned from the series.

Still, the series has been compared to soup that "came out as satisfyingly as if Sookie had just brought it to the table fresh from the kitchen, handled by no one but her," which is a level of perfection that is very prestigious (Lavery 9). The Gilmore world or "*Gilmore*verse" as it

has come to be called is incredibly literate, mentioning artists, politicians, historical and cultural events, and characters from all kinds of entertainment (Lavery 12). Its pop culture awareness has not only made *Gilmore Girls* a socially conscious television show that captivates viewers, but it also created a name for Sherman-Palladino that has left viewers adopting the show's theme song, "I will follow," in regards to Sherman-Palladino's future entertainment endeavors (Lavery 18).

The social implications of the show not only explain *Gilmore Girls'* ability to empower women to branch away from the limitations of society and the social standards that exist and instead forge their own paths of individuality, but they also function to reverse the negative stigma surrounding television. In presenting viewers with a complex-yet-relatable world, *Gilmore Girls* presents an awareness of social flaws and capitalizes on flaws related to ethnicity, class status, and gender. Its desire to encourage self-reflection for the purpose of social change refutes negative claims about television and fosters an attitude in which television becomes a social mirror for the purposes of benefiting society.

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EXPLORING BODY SATISFACTION IN COLLEGE FRESHMEN THROUGH BODY-MAPPING

Eating disorders affect all races, ages, and genders, but are most prevalent in adolescents who are vulnerable to society's standards and are unsure how to cope (Pike et al., 2013; National Institute of Mental Health, 2016). While eating disorders are a mental condition that can negatively impact the sufferer's weight, many people go undiagnosed due to the stigmas associated with eating disorders as well as normal weight (Griffiths, 2015; Thorsteinsdottir, 1991). There are three main eating disorders: anorexia nervosa, bulimia nervosa, and binge eating disorder (National Eating Disorder Collaboration, accessed 2021). Individuals suffering from anorexia nervosa "...typically weigh themselves repeatedly, severely restrict the amount of food they eat, often exercise excessively, and/or may force themselves to vomit or use laxatives to lose weight," (National Eating Disorder Collaboration, accessed 2021). Anorexia nervosa also has the highest mortality rate of all mental disorders (National Eating Disorder Collaboration, accessed 2021). Individuals with bulimia nervosa "...have recurrent and frequent episodes of eating unusually large amounts of food and feeling a lack of control over these episodes. This binge-eating is followed by behavior that compensates for the overeating such as forced vomiting, excessive use of laxatives or diuretics, fasting, excessive exercise, or a combination of these behaviors," (National Eating Disorder Collaboration, accessed 2021). Individuals with binge eating disorder "...lose control over his or her eating. Unlike bulimia nervosa, periods of binge-eating are not followed by purging, excessive exercise, or fasting," (National Eating Disorder Collaboration, accessed 2021).

Eating disorders often begin as disordered eating and may include but are not limited to restricting one's food intake, binging, purging, over-exercising, etc., and sits in between normal eating habits and eating disorder habits (National Eating Disorder Collaboration, accessed 2021). The main

difference between an eating disorder and disordered eating is the severity and frequency of the behaviors (National Eating Disorder Collaboration, accessed 2021). On the other hand, an eating disorder is not a lifestyle choice and some early signs include preoccupation with food, body weight, and shape (National Institute of Mental Health, 2016). Another difference between disordered eating and eating disorders is that eating disorders are genetic and run in families (National Institute of Mental Health, 2016). Also, eating disorders alter the brain so brain scans of women with eating disorders versus those without an eating disorder look different due to the changing patterns of brain activity in the eating disorder affected brain (National Institute of Mental Health, 2016). A big factor of both disordered eating and eating disorders is body image issues which are closely linked to self-esteem (Keeton & Brown, 1990). Additionally, body image is a multidimensional issue, not singular as was previously thought (Keeton & Brown, 1990). It is important to address these issues to further understand the depth and connection of eating disorders and body image to hopefully prevent and decrease the number of developing eating disorders in college students. This is necessary to address because of the rise in mental illness over the past few decades.

There has been a rise in mental illnesses in college students , with one in every three students meeting the criteria for a clinically significant mental health problem (Lipson et al., 2019, pp. 60). While there are a variety of mental illnesses, the prevalence of eating disorders has become a growing issue. A 1991 study specifically looked at bulimia and anorexia in college students in Iceland, finding that while "...bulimic behavior with weekly binge/purging behavior decreased from 3.2% in 1983 to 2.2% in 1986. Laxative abuse at all frequencies seems to be increasing in those students who endorse diagnostic criteria for bulimia while chewing and

spitting behavior seems to be decreasing slightly," (Thorsteinsdottir, 1991). Something else this study mentioned is that the frequency of binge eating is decreasing, behaviors of self-induced vomiting are increasing (Thorsteinsdottir, 1991). This study also reported low levels of anorexia nervosa, however, six women that reported low percentages disclosed that they had received treatment for anorexia, despite meeting the DSM-III-R requirements (Thorsteinsdottir, 1991). This study also reported finding %1.1 percent of females meeting the diagnosis for anorexia and no males meeting the criteria (Thorsteinsdottir, 1991). It is clear that there need to be revisions done to assess what treatment people truly need in order to help them best. While older, this previous study provides insight on how much these statistics of eating disorders have increased. Another, more recent study in 2011 found that eating disordered behavior had significantly increased between 1995 and 2008 in university undergraduate college students of both genders, after the scope of the previous study (White et al., 2011). This is a big concern due to the "...corresponding rates of hospitalizations, psychiatric comorbidity, and mortality," (White et al., 2011, pp. 324). These hospitalizations and time spent to address the eating disorder takes away from school which can put students back and adds more stress to their life. A 2021 study found that 4% of females will struggle with anorexia and 0.3% of males will struggle with anorexia in their life (Eeden et al., 2021) which is a drastic increase from 1991. These studies go to show how much these issues have increased overtime and they will continue to increase if schools do not step in to help their students.

As eating disorders are among the top 10 leading causes of disability in young women, (Striegel-Moore & Bulik, 2007), it is important to understand what can contribute to their development. One factor contributing to this rise in mental health issues is that the transition from high school to college is developmentally challenging and stressful (Smith & Zhang, 2009). College is associated with high levels of depression, anxiety, and stress due to academic, social, and financial struggles (Joo et al., 2009). College students have to cope with academic standards, social expectations, and overall life transition, much of which can contribute to psychological issues as a result of unhealthy or unsuccessful coping (Landow, 2006). Another contribution to the rise in eating disorders is the development of the "Western" beauty ideal along with its pressure and praise for thinness (Striegel-Moore & Bulik, 2007). This culture promotes and objectifies the thin ideal, creating a societal pressure to be thin which can heavily contribute to the development of an eating disorder, especially at the college level. In addition to this thin ideal being pushed, eating disorders generally develop during adolescence as this is a time of great vulnerability (Striegel-Moore & Bulik, 2007). In addition, certain personality traits such as "...consistent

elevations in perfectionism, interpersonal distrust, and maturity fears," (Holland et al., 2013) are commonly found in individuals who suffer with an eating disorder which may in turn impact one's probability of developing an eating disorder. Further, eating disorder research is finding that eating disorders are inherently genetic, with multiple family members suffering (Mazzeo & Bulik, 2010). Vulnerability during adolescence, a culture pushing thinness, stress, and genetic factors play a huge role in the development of an eating disorder and need to be screened more carefully, especially in college students so the likelihood of missing a diagnosis diminishes. It is important to understand how college students perceive the transition from high school to college and how such a transition impacts resultant body image and health behaviors (i.e., eating, exercise, etc.).

That being said, the purpose of this study was to qualitatively investigate college student barriers and facilitators to body image, healthy eating, and exercise, all of which can impact mental health and academic success. This study was conducted via body-mapping, Photovoice, and individual interviews. In order to complete this study, body-mapping and Photovoice was used to tell the stories of the participants. These research frameworks work hand in hand to give the participants a visual aid to help in their explanation of their body image which is a sensitive topic. These frameworks will specifically help this study with eating disorders because although questions and interviews can help, participants need to be able to show what they see and experience on a day-to-day basis which directly impacts their mental health. Going into this study, the hypothesis was that body image would be impacted by social media, articles of clothing, food/calories, and working out (or the lack thereof). Some combination of the above factors would play into how participants felt about their body on a given day and there would be some factors that while they may improve body image (such as working out), they could also make the participant feel worse about themselves. Understanding these factors will help guide treatment plans as these factors cannot be removed from one's life completely (for example people have to eat food daily to live) so individuals suffering need to learn how to cope with these factors in life.

As eating disorders are becoming more common and are extremely dangerous and life-threatening, this study aimed to look at college students' body image, eating habits, and exercise habits to understand what impacted their body image and can play a role in the development of an eating disorder. In addition, this study compiled data that may be of use to help develop screening tools in the future. This would be a significant step in eating disorder treatment and screening because individuals suffering cannot be helped if they do not receive treatment or a diagnosis.

DESCRIPTION OF RESEARCH METHODOLOGY

This study was a qualitative research study with multiple evidentiary sources to ensure triangulation of data. The following sections outline the participants, data collection methodology, and procedures for the research study.

Participants

The participants for this study included five undergraduate college students: two male and three female. Participants voluntarily signed up to participate with no incentive and were part of the research study for one week. Participants were recruited based on a convenient sample from the University of West Georgia. The participants signed a waiver stating that their identifying information would be kept confidential, explaining the study, and that they were free to stop at any time. This study had minimal to no adverse effects to the participants and was approved by the University Institutional Review Board (#UWG2021-0119). Out of the five participants, three were African American and two were Caucasian. There were three females and two males (both males and one female were African American and two females were Caucasian).

Measures

The study had three forms of measurement: body-mapping, photovoice, and transcribed interviews. This was all qualitative data so quotes from interviews were used to describe the images.

Body Mapping

Body-mapping was created to "...be therapeutic, creating a space to explore issues which were difficult to discuss and witness experiences which were obscured or hidden," (De Jager et al., 2016, pg number). In this study, body-mapping was used so participants can draw how they perceive their own bodies and talk about how they feel within themselves. This is an important part of the study because participants needed a way to show and voice how they see themselves as opposed to how they are viewed by the rest of the world. Body-mapping allows the participants to show the world what they see and how they feel in a meaningful way that captures their unique perspective of themselves. The goal of this activity is not for the participants to create a perfect drawing of themselves, but rather emphasize the parts and features they like as well as dislike about themselves. This opens up the interview to discuss these features as well as why the participants feel this way about themselves. The drawing itself gives them a canvas to showcase what they view themselves as and how important these features are for them.

Photovoice

Photovoice is a process where the participant is able to explain to the world their thoughts and feelings through a single image or set of images

(Wang & Burris, 1997). There are three main goals of photovoice: "...1) to enable people to record and reflect their community's strengths and concerns, 2) to promote critical dialogue and knowledge about important issues through large and small group discussion of photographs, and 3) to reach policymakers,"(Wang & Burris, 1997, pp. 369). In this study, photovoice will allow participants to capture and showcase what influences their body image on a day to day basis. This is so important because it strengthens the participant's voice since there is an image to visually explain the trigger.

Individual Interviews: Participants completed individual interviews at the beginning of the week to reflect on their body mapping. They then participated in follow-up interviews at the end of the week to reflect on their Photovoice pictures. The interview guide can be found below. In addition to the interview questions, probing questions were asked to clarify participant statements.

The initial interview consisted of eight questions:
1. Can you explain your drawing and what you focus on the most?
2. Can you talk about how you view yourself?
3. How do you feel about your body?
4. How do these insecurities affect your life?
5. If you could have your ideal body what would you look like?
6. How would you feel if you were able to have your dream body?
7. Can you describe your eating and exercise habits?
8. Is there anything we didn't mention that you would like to touch on?

The follow-up interview consisted of three open-ended questions:
1. Can you explain each of the pictures?
2. How did taking the pictures this week make you feel?
3. Anything we didn't mention you would like to touch on?

PROCEDURES

Participants were recruited via word of mouth and asked to participate completely voluntarily. Before the initial interview began, participants were asked to sign a consent form explaining the study, that they would be kept strictly confidential, and they could stop at any time. At the beginning of the week, the participant drew their body and explained their insecurities and how they see themselves (body-mapping). Once the participants completed the body-mapping, they scheduled an individual interview with the researcher which lasted 15-45 minutes depending on how long each participant talked. Following the interview, participants were asked to take photos of anything that impacted their body image either positively or negatively through the Photovoice technique. At the end of the week, participants explained their photos during a follow-up interview with the researcher.

DATA ANALYSIS

The individual interviews were transcribed by the researcher. The initial step of data analysis included the transcription of the video diaries. The analysis then followed Miles and Huberman's (1994) three-step technique. Data reduction involved condensing the data through selecting, focusing, simplifying, abstracting, and transforming the transcripts. Coding the data was the second step. Lastly, the coded data was analyzed into themes and findings were synthesized. The transcriptions were then thematized. The pictures were sorted and matching quotes from transcriptions were added as well. The drawings were also sorted with their respective explanations from interviews. The data collected was sorted into four main categories: body image issues, social media, food, and exercise.

LITERATURE REVIEW

A 2013 study on eating disorders, *Psychological Factors Predict Eating Disorder Onset and Maintenance at 10-year Follow-up,* found that perfectionism was a high predictor of eating disorders (Holland et al., 2013). This was an important study to review for this current research because it provided background on one strong predictor of eating disorders. As eating disorders are so complex, it is not just one personality trait that can cause them to develop. While the current research study focused on body image, this 2013 study shined a light on another trait that can very easily go hand in hand with poor body image. The goal of the current research study is to bring to light more attributes to screen for college students, so this study adds another dimension of what to look for. This 2013 study was extremely insightful regarding perfectionism and its effect on eating disorder development, which prompted further research into stressors college students face.

In relation to stressors college students face, the following book and study respectively, *Stress and Mental Health of College Students and The Academic Impact of Financial Stress on College Students,* both thoroughly explain the relation between stress and college students. Both also discuss the ways in which college students can choose to cope, whether that be positively or negatively and how that can impact their mental health. *Stress and Mental Health of College Students* focused on changing the ways in which college programs were implemented and providing stress relievers as well as positive coping skills for students. This book and study was fantastic for analyzing the tremendous amount of stress college students go through as a result of their classes, which can easily lead to poor coping mechanisms such as restricting, etc. The second study, *The Academic Impact of Financial Stress on College Students* focused on the financial burden college students carry in their day to day lives. Financial stress is an immense part of college that many college students are unable to properly cope with. These two studies shine light on the stressors college students have which when dealt

with poorly can easily lead to poor body image and potentially an eating disorder.

Probably the most significant study for this research paper was *Disordered Eating and the Use of Unhealthy Weight Control Methods in College Students: 1995, 2002, and 2008.* This study explicitly looked at the relationship between unhealthy weight control behaviors and eating disorders. While et al. found that these unhealthy weight management behaviors increased dramatically over time, thus making the students meet more qualifications for eating disorders. As a result, this study explicitly says college students need to be screened more frequently and carefully for eating disorders, specifically in regards to unhealthy weight management tools (White et al., 2011). WHile this study does not specifically mention it, the timeline goes along with the rise in social media, something that this current study hypothesizes will play a role in participants' body image and thus their weight control techniques.
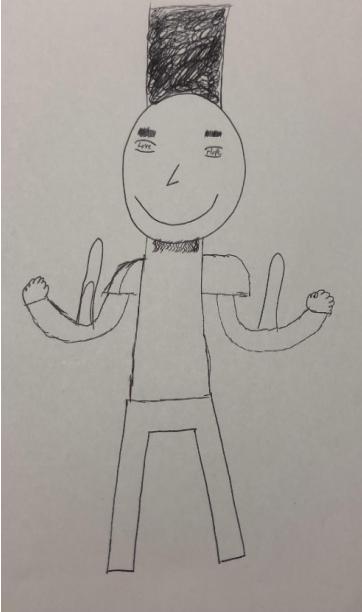
Not only do excessive use of weight control techniques have an influence on eating disorders, but low self-esteem is also a predictor of eating disorders (Keeton & Brown, 1990). In addition, this study, *Body Image or Body Images?: Comparative, Multidimensional Assessment Among College Students,* found that low self-esteem was associated with overestimating one's size (Keeton & Brown, 1990). It has already been established that low self-esteem is related to eating disorders, so this study provides a unique angle to understanding one possible explanation of low self-esteem. This study also fits nicely with the current study as poor body image and low self-esteem go hand in hand. As a result, both are predictors of eating disorders and need to be screened for and kept a closer eye on.

These studies shine light on the possible contributing factors of eating disorders, but none of them fully dive into the complexity of body image in college students. This is where the current study fits in. This study will focus on what impacts body image to try to alleviate one contributing factor at the root cause in order to decrease eating disorder rates and get college students the help and support they need.

PRESENTATION OF RESEARCH DATA

Initial Interview and Body-Mapping

This section shows the body-mapping pictures participants drew before the initial interview. Along with the photos, quotes have been selected to further explain the drawings in the participants' own words.

Supporting Quote	Image
"Personally speaking, there are some things I can't control. I won't lie and say I like my body-there are some things I really don't like. For example my height; I really don't like my height. At the same time, that's something I can't really control so it's something I had to grow into. I personally don't like my body to some degree, I always love myself and I always believe in my self worth, but with my appearance there's some aspects I really don't like. My height is just such a big factor and some women won't give me a chance at all simply because of my height alone."	

"Yeah, I focus on my stomach-I want abs. That's the only thing I have a problem with. I'm really self conscious about my stomach. A lot of people don't understand this, I'm obviously skinny, and when especially bigger people hear me complain about my weight they say "oh I would want to look like you". But they don't understand-skinny people bloat so badly-maybe not all skinny people-but I do. I bloat so bad I'll literally look 4 months pregnant after I eat a good meal, and that's one thing I have a really hard time with. I have tried so many dietary supplements, I've tried cutting carbs out, I've tried cutting dairy out, and nothing works. I think it's just my body, but yea that's my biggest insecurity and everything else I'm good."
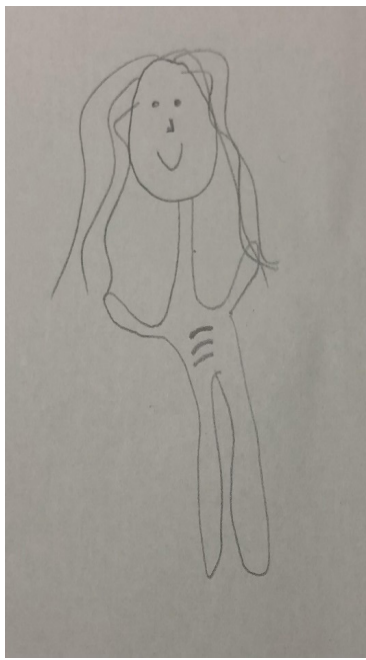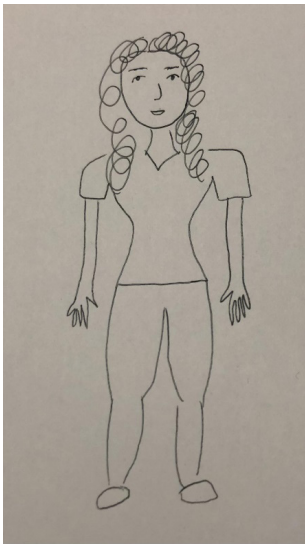
"With this drawing it's just a general description of me: I drew my black hair, eyes, nose. I noticed too that I didn't draw a smiley face or a frowny face-I drew a moderate expression because that's how I feel most of the time. I'm neither happy nor sad-I just go in without any expectations. Whatever happens determines whether I'm happy or sad. But, for the most part I usually try to keep that undisclosed. Usually I don't show much expression anyway. Then arms, chest, and another thing was the size of my stomach-not really happy about that. It's an area I wanna focus on and fix. I drew my legs and feet. Really the thing I focused on were my facial expressions and my mid section"
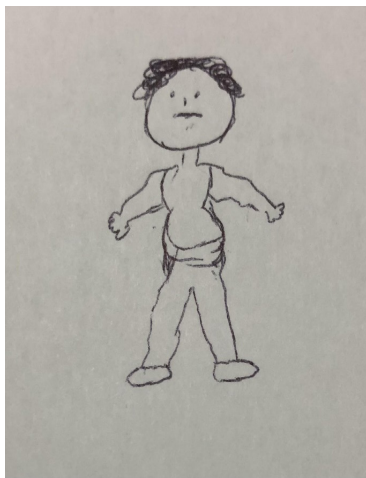
"I tried to make it seem like the girl is tall with skinny legs because that's something I notice on my legs-they're just straight up and down.I've struggled with my body before because everyone always commented on my body. I never thought it was a problem until people commented on it. People would say I'm so thin and it would be people I didn't even know. So I thought since everyone is pointing it out there must be something wrong so I used to always say I wanted to gain weight but it was so hard. I don't know if I accepted myself because it was hard to gain weight or what, I just know I can't gain weight so it's something I just need to accept."

"Yes, ok, so obviously I have curly hair-I feel like that's a defining feature for me, so I wanted to make sure that my curly hair was a part of it. With the face, I'm not much of an artist so I couldn't get much detail on my face, so I think that's just broadly what my face looks like-eyes, nose, lips. Body, I feel like that's a general shape of what I look like I guess. I have a waistline, sturdy legs."	

Follow-up Interview and Photovoice

1. Body Image issues: The following images are from interviews where participants noted strong feelings in relation to their bodies. In some images, participants are feeling positive emotions and are happy with their bodies, while in others participants were extremely unhappy with their bodies as can be seen in the supporting quotes from the interviews. Issues in this section are related strictly to how they perceive their body to look.

Supporting Quote	Image
"This was my 20th birthday. I love how I look in every way in this photo. Sometimes I forget what I look like, and I need to be more confident in myself and learn to love myself."	

"I love this picture and I hate this picture. I remember not eating on this day because I knew I would be swimming with some friends. Which is very unhealthy, but I wanted to look "good" in the pics. This was a year ago, and I realize now feeling weak and hungry isn't worth a "good insta pic". But I still feel like I look bloated in this picture."

"This was 2020. I felt so great in this outfit. Still love and wear this outfit all the time. But I remember later in the day I ate a big meal and ended up covering up with a jacket because I felt so bloated and heavy."
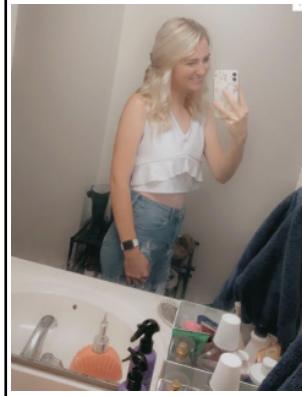
"In this picture I felt great. It was my senior trip in 2019. I was very happy with how I looked and very confident."

"This was my senior year of high school 2019. I remember feeling bloated and thinking I looked huge compared to my friend. Then after looking at the photos I saw how skinny I actually look. I still have a hard time with body dysmorphia. Now looking at the photo I think I looked good and healthy in it."	
"This is me in a swimsuit and I was just trying on swimsuits, it's something I do often like bodycheck sort of. I just thought I looked good in this particular pose. This swimsuit I will probably never wear in public because I don't like how it looks if I'm not posing, but in that pose and that moment I liked how I looked so that's why I took that picture."	
"This is a picture of me after I ate I think half of a pizza. At the moment it was kinda funny because wow I'm so bloated I look pregnant that's kind of funny, but then I would have it in my camera roll and see it sometimes and I would think "ew what's wrong with you" so started out funny but I thought it was super embarrassing but dedicated to the research so I sent it to you anyway. I know I don't look like that all the time but then it kinda becomes what I think I look like."	
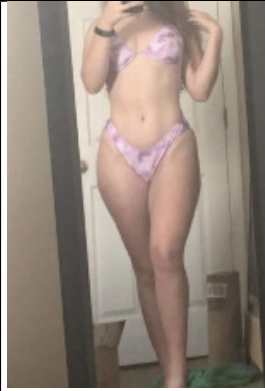
Social Media Issues

The following images are screenshots participants took from social media. The general theme in this section is comparison. Participants compared their bodies to the social media image which in turn made them feel bad about their own bodies. Also included in this section is the influence of magazines and the power, specifically fitness magazines, hold over participants' views of themselves.

Supporting Quote	Image
"I feel like I could never pull this dress off. It's a cowl neck dress so the front part goes down and shows her cleavage. I feel like I could never pull this off because I don't have cleavage. I think she looks so good in it because she does have a good breast size."	
"The last one is someone talking about how they got a BBL (Brazilian butt lift). Her caption says "I'm not joking, getting a BBL was the best decision I've made in my entire life". So, you can see her before and after. Her after looks so good. I don't know what she thought was wrong with her body before, but now she has a tiny waist and a bigger butt."	

"The next one is-butt. It's this girl who would come up on my explorer page a lot on Instagram-it's college clean eating. She's just super fit and has a huge butt. Her progress pictures are insane-her before is just ridiculous-she looks amazing. "What the heck, how can I get like that I can't get like that" it's just disheartening and would make me look at my own body and make me feel bad about it. This is something that would randomly come upon my Instagram and put me in a bad mood and a bad headspace."	
"This is some random Instagram girl who was once again on my explorer page. She just looks perfect-her stomach is super flat and defined, but she's also got nice hips and looks very good. Even on my best day that's not what I look like. That's what I would like to look like- how do you wake up looking like that and just not feel awesome about yourself."	

"I was just looking for swimsuits on shein and I was looking at reviews. I thought "what the heck" because this is just some random girl taking a picture to review a swimsuit and she looks incredible, very much goals, body! And I got the swimsuit and it doesn't look like that on me. I'm just trying to find a swimsuit and I can't not think about "it's not going to look like that on you though let's be realistic here-what's it going to look like on you?" so that made me kind of sad"	
"The second picture, I have a bunch of fitness magazines that are still in the wrapping, I probably need to start looking at them because I realized it would probably be smart to open them up and read more about fitness and nutrition. Maybe I can learn some new techniques and maybe take a picture of that and it would help my body image if I gained some more knowledge and put it to work. I realized maybe since I don't do that, that's why I'm such a fat pig"	
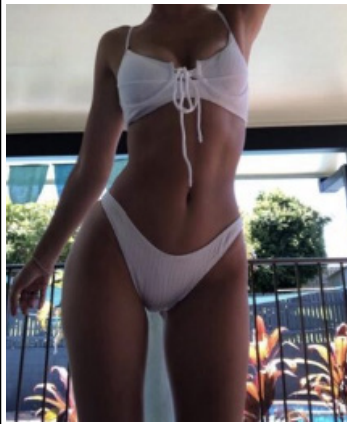
"I took one more-it's usually the stuff you see on social media-the magazines and the ideal body. What everyone strives to be-to be on the cover of a magazine. I always wanted to be like that and look that way, so that definitely plays a big impact on how I see myself and how I want to look ."
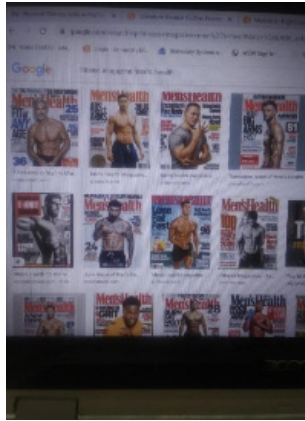
Food Issues

The following images are pictures participants took, deeming these foods as "good" or "healthy", thus having a positive affect on their body image. As a result of these meals, participants felt better about their body and thought they were doing something "good" to change or alter their body.
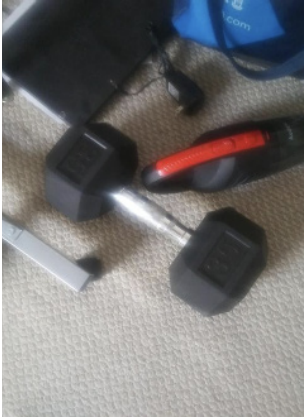
Supporting Quote	Image
"The last one, I didn't mean to include this but it definitely works. It's what I ate the other day. It's just oatmeal, apples, a banana, and a protein shake. I had felt like I was eating bad the past few days, eating out a lot, and I hadn't eaten all day and it was probably 2. I thought "well you had fast food last night" and I wasn't really hungry but I felt bad, like my body felt bad but I felt better after I ate so I thought "well you didn't eat". I just felt like this was good food so I felt ok eating it, but also I thought I was eating a lot of carbs and drinking a protein shake-you shouldn't need to eat much for the rest of the day. Just mentally tracking calories even though I wasn't actually tracking calories. And with this beach trip in mind, just all of that you wanna look good."	

"This is a picture of some food I was eating a lot-I would have this everyday for at least one meal and it was food I considered healthy. I felt like it had a good macro count. It's chicken salad on naan bread. It's a low fat chicken salad, I know the calorie count of it with tomatoes and mozzarella and vinegar. I really liked how this attested too-it was like a win win because I liked how it tasted and it was healthy. When I was eating this I would just feel like I was doing a good job-satisfied with the taste and satisfied with the nutrition of it."

Exercise Issues

The following images are strictly related to exercise and how it affected the participants body image. For some, it was negative to see weights that they haven't touched and for others the gym and workout outfits served as a motivator and were associated with positive emotions towards their body.

Supporting Quote	Image
"So, one of the first things I took a picture of was some workout equipment I had at home that I barely use. So, I realized that if I probably use that more it would help me toward my goal as opposed to just sitting there so that really made me think about taking that and how it could impact how I see myself and maybe start using it at home if I can't make it to the gym so it could help my body image."	
"This is me again in my favorite gym outfit-my subway shirt. I think they're my fabletics leggings, I'm not sure. I just felt good that day. I was excited to go to the gym in my favorite thing to wear to the gym, I like how that shirt is tight in the areas I like it to be and I like where it sits on me. I was just feeling good about myself and excited to workout."	

ANALYSIS ON RESEARCH DATA

This current study on body image in college students found that the main sources that contribute to poor body image are social media, food, and exercise. This is congruent with a study that mentioned weight controlling measurements (i.e. exercise) and how excessive use can lead to low self-esteem (Keeton & Brown, 1990). Something else this study brought to light is that most participants had labels for food that were either "good" or "bad" that could contribute to the way they felt about their body, also congruent with Keeton & Brown's 1990 study. This is important because while this is an older study, it goes to show just how deeply rooted an issue this is for college students. The current study demonstrates how these issues have grown and become more widely spread throughout college students. All five students in the current study reported dissatisfaction with their bodies, and

while this is a small sample size, it is a harsh truth that all five expressed issues with their body.

This current study also brought to light the impact social media has on college students' body image which is congruent with a previous study (Striegel-Moore & Bulik, 2007). In addition, while not explicitly mentioned, students did report that their mental health was difficult to address as they were so stressed and overwhelmed with school which is supported by multiple studies as well (Joo et al., 2009; Landow, 2006; Smith & Zhang, 2009). Every student brought up social media in some way-whether that be comparing themselves to others online or fitness pressure from social media. Social media is something that everyone has access to and while there are benefits to social media as the students touched on, as a whole it can be fairly toxic and can have serious consequences on students' mental health.

The biggest takeaway from this current study is that poor body image is a much more common issue in college students than previously thought. In addition, that poor body image plays a large role in students' mental health as well as the relationship they have with their body (eating, exercise habits, etc.). As previous studies have shown poor self-esteem and body image are precursors to eating disorders (Keeton & Brown, 1990), this current study highlights how important it is for colleges to not only regulate screen for body image in students, but to also make sure this screening is detailed and be able to provide students with the help they need. If this can be accomplished, students have a higher chance of avoiding the development of a full-blown eating disorder and can start the path to recovery much sooner, hopefully not taking time from their college career due to hospitalizations (White et al., 2011).

CONCLUSION

This study provides insight into college student perceptions of factors (i.e., social media, food, and exercise) have on body image. The photos of participants along with their accompanying quotes generally discuss a lack of or excess food that contributed to distorted body image. Each participant expressed issues with their body, which is an issue that needs to be addressed at the university level. Such body image distortion was exhibited through the body mapping, individual interviews, and Photovoice image analyses.

While this study was successful, there were several limitations that could be addressed in future research. First, having a larger sample size with participants from a variety of universities would help with the generalizability of the results. Since this study only recruited participants from a southeastern university in the United States, it is difficult to make overall generalizations. In addition, a wider range of ages, ethnicities, sexualities, religions, and genders would be preferred to get a more holistic sample of college students. It would be interesting to examine how body

image changes across the college experience (i.e., from freshman to senior year).

The goal of this study was to qualitatively provide insight into college student perceptions of body image and the factors that contribute to body image. As poor body image is a precursor to eating disorders, hopefully this study shows the importance of screening specifically with body image at counseling centers and health centers on campuses. Hopefully this research can be repeated on a larger scale and provoke change among the university school system in terms of eating disorder support.

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CLIMATE CHANGE DENIAL

What are the influences of climate change denial and how do they compare in a developed and recently developed country? Climate change is a global issue but an even more difficult issue to define and understand is climate change denial. We can advocate and fight for climate justice but if our representatives do not believe climate change is worth addressing in environmental policy, then how can we make a change at a political level? Throughout my research, I use multiple journals, books, articles, and government documents concerning climate change and climate change denial to enforce my ideas and to provide context to the conversation of climate change denial. I will not only look at how the U.S. deals with climate change under different administrations but I will also include a comparison of U.S. action to climate action in Bhutan. My goal is to find the top influences of climate change denial in the United States, study how environmental policy is dealt with under different administrations, and look at environmental policy in the U.S. compared to a smaller and less developed country such as Bhutan. Environmental policy is weak in the United States and can be partially blamed on the culture of climate change denial and the many influences that fuel this.

I will identify the top influences of climate change denial in the United States so I can help pave the way to finding solutions to this environmental issue. I will start by identifying the top climate change denial influences. I will then talk about how climate change denial and environmental policy have changed since environmental policy was introduced. Further, I will compare action on environmental policy between various administrations of different parties and ideologies. I will finally compare climate change denial, environmental policy, and the importance of the environment between the U.S. and Bhutan. I chose these two countries because the United States is a large, profiting, and well-established country whereas Bhutan is a smaller

country not only in size but in profit and production as well.

Climate change denial in the U.S. is the top issue I am focusing on. There are three major factors that are the most influential in fueling climate change denial in the United States. The first factor is influence through buying votes. Monetary donations made to political campaigns are public knowledge but there are still ways that individuals and corporations can buy influence from politicians. An oil company can pay for campaign advertisements and commercials for a politician and in turn, that politician will be more influenced and more likely to vote against environmental policy that will hurt that oil company. The second influence I have identified is media influence. I am focusing more specifically on social media instead of news media. Social media can influence an individual's opinion and social media claims can be dangerous in this way when the audience believes information found on the internet without doing their own credible research. My final identified influence is direct and indirect socialization. This finding simply means that individuals can be influenced through socialization with their direct peers and family but can also be influenced by what they hear and see from politicians and news media on the TV.

My second focus of research will focus on the comparison of environmental policy action since environmental policy was introduced at the federal level and a comparison between administrations of different parties and ideologies. It is no secret that different parties have different views on certain issues but oftentimes we look at party differences and we forget ideological differences. Some support strong environmental policy in the Republican and Democrat parties but if we look closely, we may be able to tell that those who support strong environmental policy are aligned with more liberal views. Although it is not very common, there are conservative Democrats and liberal Republicans. In this section, I will first identify when

environmental policy became part of the agenda of the government. I will start with that administration and work my way to the present-day administration to study how environmental policy has changed. Which administrations have passed or repealed the most policies? Was environmental policy not on the agenda for any administrations? I will then focus on the parties of these administrations and compare them. I will ask the same questions that I mentioned earlier about the use of environmental policy but this time I will compare political parties and eventually I will make my way to comparing political ideologies between administrations. I will also keep in mind the time period and years that these administrations were in office to see how environmental policy has evolved in the White House.

The third focus in my research will be to compare the United States, a well-developed and prosperous country to a smaller country that has only recently been taken off of the underdeveloped country list, Bhutan. These two countries are very different in their values, economy, and location. The U.S. is a very diverse country of many beliefs, languages, and cultures. Bhutan is a country that is very traditional and has various dialects but is still very culturally different from the United States. The U.S. has an economy focused on technology, retail, construction, and more. The economy of Bhutan is mainly different in that it is very focused on agriculture and forestry. A large portion of their economy is also from travel because of their well-preserved forests and landmarks. Although the U.S. has many natural landmarks that attract tourists, it does not rely on that industry as much as Bhutan does. Finally, the U.S. is much larger than Bhutan. Bhutan is between two of the most polluting countries in the world, China and India, which is a reason why they are so environmentally focused on offsetting their pollution. Bhutan, for such a small country, is much more advanced than the U.S. when it comes to environmental policy. They have environmental regulations implemented into their Constitution, a drastic difference from the U.S. I will take these policy and regulation differences and compare them between the countries. Bhutan willingly and peacefully became a democracy in 2007 so I will briefly compare their government to the U.S. government to see the differences in how willingly environmental policy is introduced.

Overall, the main goal of this paper is to identify the top influence of climate change denial to make a step towards identifying solutions to these issues. An important first step in finding these solutions is stating the problem and what influences the problem. Once these influences are understood at different levels such as where they come from, where they are seen most in society, and who they affect the most, we can work towards finding a solution. Once these influences are identified it is important to look at the climate change denial and environmental policy subject at a high political level such as the White House. Finally, a comparison between Bhutan and the United

States works as a way to identify what the two countries do differently in the topic of environmental policy. This comparison is a good way to identify the similarities and differences between the two countries to identify what could work the best for the United States when it comes to addressing climate change. This comparison also works as a way to show encouragement that if a small economy like Bhutan can be this environmentally successful then the United States can as well.

One party, ideology, or president is not enough to solely blame for the lack of environmental policy. Gus Speth places the blame on many shoulders from the media to politicians. He addresses possible solutions such as renewable energy and holding big polluting corporations accountable. Speth has worked with the environmental movement for decades and has even worked with multiple administrations in the White House on environmental issues. Speth is asked specific questions about climate change, climate change action, and climate change responses and he believes that the real polluters should start taking more accountability along with organizations, the government, and the media. He also believes in pushing for more action from the government instead of settling such as decreasing our large energy consumption and swapping to greener solutions such as renewable energy.

There is the frequent assumption that climate action is bad for the economy. The International Renewable Energy Agency found that renewable energy does not hurt the economy but instead helps it. Renewable energy increases global GDP and improves welfare such as providing a cleaner environment to live and work in. Green and renewable energy even helps create new jobs and dependency in the energy industry. IRENA used macro-economics to perform its research on the economic effects of renewable energy. They also use statistical data, country studies, and comparisons to study the economic effects.

Climate change denial is not just an issue with the public but it is an issue inside Congress as well. Over 100 politicians in Congress have expressed some level of doubt about the truth of climate change. Ellen Cranley found that over 100 politicians in Congress have been skeptical in the past or are still skeptical about climate change and whether humans contribute to it or not. Cranley quotes politicians who have made comments about how they are either not sure about climate change or do not believe in it at all. She found that even if scientists and the public support addressing climate change, that view may not make its way to Congress simply because of the climate change denial present in the Capitol.

Julie Oliver with Data For Progress acknowledges that many Americans, despite a large climate change denial culture, are pro-environmental policy. Most Americans support progressive ideas such as a Green New Deal and legalizing marijuana but that does not translate to action.

Oliver blames this lack of action on politicians opposed to liberal-leaning progressive ideas who are able to gerrymander district lines to manipulate voting results. She also blames issues like big money in government and the population divide between large and small states in the U.S. Senate. Americans support progressive ideas that include more environmental policy but suppression from the powerful opposition holds those ideas from making their way to Congress.

The *Oxford Handbook of Climate Change and Society* identifies the history and strategy of climate change denial such as the question of the need for environmental policy during the Reagan administration. They go into detail in environmental subcategories such as the fossil fuels industry, the strategies of think tanks, and conservative media influences that have occurred for decades.

The fossil fuels industry is a large donor to the climate change campaign. Andy Rowell reports that the fossil fuel industry has donated billions of dollars to lobby against environmental action that could hurt their industry. Rowell addresses the issue of the lobbying field and how that relates to what could be considered buying votes from government officials. Rowell has found that the fossil fuel industry donates billions of dollars to lobby against environmental action and is in an unfair position to vast resources that will allow them to continue to lobby against any climate action.

Not many are officially informed about what is allowed when donating to campaigns. The *Electoral Knowledge Network* addresses buying votes and goes into detail on the topics of what it looks like, enforcement, and possible remedies to this issue. Author Jeffrey Toobin of *The Oath* talks about a court case named *Citizens United v. FEC* that goes into detail about the rights of groups to put out media that affect campaigns. This case goes on to even protect campaign donation rights which play into the issue of buying votes. The *Federal Elections Commission* identifies who can and cannot donate to political campaigns in the United States. The purpose of this source is to include what is legal in donating to a campaign so it is easier to identify what can pass as "buying votes."

Climate change denial is an issue in the United States but how do we address this issue? Liza Gross believes we can address the issues of climate change denial through stories with an emphasis on the truth. Gross addresses the issue that scientists and other professionals have battled with conspiracies and misinformation for a long time. Gross talks about a photo of a thin polar bear that went viral on the Internet. The photo was intended to spread awareness about global warming and its effects on ecosystems and species. Those who did not believe in climate change found photos of polar bears who were not starving to combat the initial argument to say that there are polar bears that are not starving so therefore climate change does

not exist. Gross also includes the work of two scientists who are studying arctic marine animals to see how they adapt to the changing temperatures. Their work feeds into the idea that stories should be told to spread awareness and information about important topics and in this case the photos are the ones telling the stories. Gross believes that we may need to start sharing how scientists are finding their research and how they are doing their work to elicit a response that will get the public interested in addressing climate change.

Flora et. al take a different approach to the effects of climate change. These authors focus on the impacts on public health that climate change has. The major finding in this study is that climate change has an effect on individuals and public health that ranges from low risk to high risk. Flora et. al found that family socialization with adolescents in the family about topics in the media helps to curb and avoid the stressor on individual and public health in general.

The state cannot be relied on to take charge of environmental action even if its citizens are in favor of it. Environmental action taken to combat climate change must come from the federal government to help curb issues such as national carbon emissions. Cynthia Giles believes that even if the EPA was seriously cut back on funding and environmental control under the Trump administration, the states would not be able to pick up the slack. A state can enforce air pollution regulations but they cannot control the regulations of the state pollution upwind. Another issue is that large polluting companies often do business in multiple states which makes it hard for individual states to take control of their environmental regulations. Giles lists that the federal government is the best option for enforcing and implementing environmental policy due to reasons such as state disagreement, differences, and simple federal and state law restrictions.

In the comparison of administrations in the White House on environmental action, it is necessary to study how "green" presidents were. Chris Peak researched the presidents from Nixon to Obama to study how environmentally friendly they were. Peak includes opinions from various individuals and sources when it comes to ranking presidents and their environmental actions. While Peak credits President Carter with being the best modern president when it comes to the environment, Michael Gerrard who teaches at Columbia Law School credits President Obama as the more environmentally friendly president. In this study, Carter is given the number one spot for the "greenest" president while George W. Bush, in this 2015 study, is ranked as the worst modern environmental president.

A review by *Pew Research* addresses political polarization in the U.S. and how that translates to the environmental field. Republicans and Democrats are now ideologically further from each other than ever before.

There has been a great shift from moderate to extreme ideology. Republicans and Democrats are so divided on issues now that it is easier to study specific issues and views because there is less overlap. Those who believe in environmental action are not only divided on the partisan line but are also divided by ideology. The two extreme ideologies in this study that are discussed are Solid Liberals and Core Conservatives. Around 95% of Solid Liberals believe that there is clear evidence that climate change is manmade but only around 5% of Core Conservatives believe this. The purpose of this research is to see where on the ideological spectrum environmental action becomes a serious focus and how that spans from one side of the spectrum to the other. The analysis revealed that more concern for climate change is more likely to be found with those who identify as liberal but that concern was found across all categories even at the Core Conservative level, although the percentage of those concerned was much lower than the concern found with Solid Liberals.

When compared to other countries, the U.S. does not perform well in environmental action. In fact, Alexandra Kelley reports on a study by MIT that ranks the U.S. as 40th in the world for environmental action involving renewable energy. The issues taken into consideration include transition to green energy, carbon emissions, policy, and more. Kelley addresses that the United States does not have strong environmental legislation in place. The U.S. is at a low ranking in the countries studied by MIT and there is only hope to improve with new administrations and new ideas going forward.

Another source used to internationally compare U.S. action is a *TED Talk* video presented by the Prime Minister of Bhutan, Tshering Tobgay. Tobgay addresses Bhutan's excellent climate change response and achievements such as becoming carbon negative. Tobgay acknowledged that Bhutan was a small country with little resources situated between two of the largest and most polluting countries in the world, China and India. Even with the odds stacked against them, they were able to implement laws that kept their ecosystems conserved and their carbon emissions low, or negative in this case.

The Constitution of the Kingdom of Bhutan was used in my research simply to study the frequency that environmental topics were addressed in the Constitution. The Constitution of the Kingdom of Bhutan was passed in 2008 and unlike the Constitution of the United States of America, which Bhutan is compared to, it includes Articles that address the environment. In Bhutan's Constitution, 60% of the forests of Bhutan are to remain untouched to ensure adequate protection and conservation. Bhutan has achieved being carbon negative while being located between two of the largest and most polluting countries in the world. Their achievement proves that they have sufficient regulations and laws set in place that helped them to achieve this

goal which leads Article 5 of their Constitution to not be much of a surprising find.

How can we solve the issue of climate change if our representatives and constituents don't believe climate change exists or is a problem? Environmental policy is weak at times in the United States because many citizens and politicians don't think resources should be spent on it. Multiple factors play into climate change denial such as paid-off politicians, social media, and socialization. Those who do not want to see improved environmental laws buy votes by doing things such as paying for campaign commercials. There is also heavy influence from our peers directly and what we might see on the TV indirectly. We are more likely to believe what we see and if we do not see the physical and immediate effects of climate change then we are less likely to believe it exists or is even a threat. Gus Speth talks about why the climate change message has not gotten through after many years of awareness and activism, "One reason is that these are not backyard issues for people, like the issues of the 1970s". The issues he refers to are the major topics of water and air pollution that the Nixon administration addressed in 1970 and 1972. Social media also works as a medium through which false information is spread and arguments are produced against the fight to end the United States' contribution to climate change.

Traditionally, buying votes is an exchange of favors between a politician and a constituent with focused interests. This exchange of favors can include monetary donations to a campaign, paying for a campaign commercial, or even giving season tickets for an NFL team in exchange for the politician to vote a certain way. The *Electoral Knowledge Network* lists simple components of basic vote-buying such as, "promising, offering or giving; money, goods, services and/or other inducements (such as promises of employment or special favors or treatment)". The public may see these favors as an individual or group simply supporting their preferred candidate by donating to their campaign but we often overlook that this is an effective way to buy votes. Jeffrey Toobin, the author of *The Oath,* talks about a case called *Citizens United v. FEC,* a landmark Supreme Court case that protects the rights of advocacy groups to put out media and any type of political communication under the protection of the First Amendment. This case helped mainly advocacy groups to not have legal limits on campaign finance donations and allowed them to use the finances to create propaganda and commercials for candidates or against certain candidates. This case makes it possible for advocacy groups to work in place of candidates within 30 days of a primary election. After *Citizens United v. FEC,* these restrictions only held up to candidates putting out the commercials for themselves, not advocacy groups and outside parties of the campaign funding and broadcasting the commercial for the candidate. This ruling helps protect the rights of anti-

environmental policy groups to be able to campaign for specific candidates without the same restrictions as a candidate.

Someone who is connected to the oil industry can easily influence politicians to vote against environmental laws and regulations that can harm that industry. There are many laws and regulations on campaign donations but there are still ways that individuals and groups can buy votes that the public is not aware of. There are gaps in the understanding of what buying votes really looks like and this is how the individuals and groups get away with it without any backlash from the public. The *Federal Elections Commission* states, "Unlike a partnership, a professional corporation is prohibited from making any contributions because contributions from corporations are unlawful". This clearly shows that corporations themselves cannot donate to a campaign but individuals still can. Although some politicians may vote against environmental policy out of concern for it negatively impacting the economy, that is not the only reason they vote against that type of policy. Oil companies are just one example of lobbyists who use their resources to influence campaigns and voting. The *International Renewable Energy Agency* released a report that fights against the argument that environmental action, such as transferring to renewable energy, will only harm the economy. *IRENA* writes referring to the benefits of renewable energy, "It provides empirical evidence that economic growth and environmental conservation are fully compatible, and that the conventional consideration of trade-offs between the two is outdated and erroneous."

Oil Change International, a non-profit organization focused on the oil industry's effects on climate change reports in 2018, "From 2000-2016, the fossil fuel industry spent nearly $2 billion lobbying to prevent climate action in the US, according to a new academic study published yesterday." Of the money that is spent on lobbying for climate change-related issues, 17.7% is from the fossil fuels sector compared to renewable energy at 3.8% and Environmental Organizations at 2.3%. These numbers alone show the disproportionate support that gives the oil industry an advantage over pro-environmental lobbying with spending alone. Even though we cannot clearly identify individual donations to campaigns as lobbying against environmental policy, we can look to anti-environmental policy lobbying spending from the past decade as a clear indicator that powerful elite groups in the U.S. are harming the movement against climate change and putting their own politicians in power.

Talking to peers can influence us in many ways but it can also influence our views on political issues. Individuals can be influenced directly by the conversations they have with parents or friends about a specific stance on climate change. An article about information seeking states, "Those in the responsive and avoidance groups sought more information on climate

change than the indifference group. Family communication on global warming was positively associated with adolescents' information seeking." They can also find indirect influence about climate change from what they see on television. If a politician puts out a commercial condemning his opponent's environmental policy plan or a commercial against environmental policy spending in general then a viewer can take this negatively and not support environmental efforts. If one's peers and selected media are against addressing climate change then that individual can easily adopt those same views without further investigation on the topic. A type of socialization that uses social media and political influence combined is coordinated denial. Coordinated climate change denial looks for any mistake made by pro-environmentalists, such as mistakes made in research at a conference, and uses this against the movement. The *Oxford Handbook of Climate Change and Society* states, "It consists of the above actors as well as a bevy of amateur climate bloggers and self-designated experts, public relations firms, astroturf groups, conservative media and pundits, and conservative politicians." Although there are mentions of media in this strategy, this is a way that socialization works. Politicians get on the TV and talk about their opponents' views on climate change not being the answer or being a waste of time or think tanks take their own narrative and share it with the public.

The third major influence in climate change denial is influence from the media, more specifically, social media. An example of this influence is an image of a starving polar bear going viral on the internet to spread awareness of climate change's impact. Those who did not believe in climate change used an image of a healthy polar bear to prove that climate change is not real. They essentially argued, "This polar bear is not starving so it disproves your image of a starving polar bear as proof of climate change existing." Climate change deniers are not the only ones to blame on the topic of social media. Liza Gross talks to two scientists Dahlstrom and Scheufele about their professional opinions on storytelling on the internet to gain sympathy for the environmental movement. Dahlstrom and Scheufele both agree that pro-environmentalists are just as guilty at creating their own narrative to gain support for their movement as climate change deniers online. Gross writes, "But powerful vested interests that are intent on denying inconvenient evidence also play a role."

Although we can blame climate change denial on individuals and the things that influence them, we must also take a look at the institutions that have control over environmental policy. The executive branch and the different administrations that have gone through the White House since environmental policy made its way to the presidential agenda are important areas to look at climate change action. Political party affiliation, ideology, and time period are three major factors that play into how an administration

takes action against climate change. Does a certain president not act on climate change because they are a Republican or does it have more to do with their ideology? Just because Democrats are more active on environmental policy does not mean that all Democrats are like that. A Democrat can still be conservative and it is their ideology that helps shape their opinions on certain issues. Joe Manchin, a Senator from West Virginia, is a Democrat that leans towards the right side of the ideological spectrum. Manchin is a Democrat but tends to lean towards conservative views which means that his vote is very important because it can either halt or speed up the passing of certain laws depending on the bill.

The issue of lacking environmental policy must be addressed at the federal level because leaving environmental regulations and rules up to the states is not the right answer. The federal government has to be in charge of something that affects everyone because states are more interested in passing laws that affect their citizens, not the citizens of another state. Cynthia Giles writes, "The federal government has the responsibility to protect everyone — like the millions of people on the East Coast who suffer the effects from large air polluters in the Midwest." The time period that an administration is in office can also affect how that administration addresses certain issues. Although the United States is a progressive country that is becoming more accepting of liberal ideas and beliefs, this does not always translate to the topic of environmental action. Julie Oliver with *Data For Progress* phrases this as, "Our government isn't progressive - but America is." This progressiveness can be seen through Americans fighting for more human rights and representation and even climate justice but it does not always show in the laws and bills passed by the government.

Nixon's administration was credited with starting the rise of environmentalism. Although time went on, administrations did not necessarily become more accepting of spending resources on climate change. Even though America is progressive in accepting liberal policies, how do the White House and executive branch show their support for environmentalism? How has the White House differed between administrations in addressing climate change? This unanswered question could help us analyze future administrations and potential candidates to predict how they will handle climate change. Knowing how to gauge a candidate on their views and potential actions towards the environment can help voters select the right candidate to address climate change to ensure that climate change denial stays out of the White House.

Climate change denial is not a new concept. Environmental policy has been around for decades. This means that since there are groups that support environmental policy, there are going to be groups that do not support it. Different administrations have taken different approaches

to address climate change in the United States. President Nixon signed the Clean Air Act of 1970 and the Clean Water Act of 1972. These were big steps in bringing basic protections to environmental resources. A more recent example of climate action, although it is negative climate action, is the Republican Trump Administration repealing more than 100 environmental rules and regulations. On the other hand, Democratic President Obama and his administration are credited with being one of the most pro-environmental administrations. Even though President Obama is credited as a pro-environmental president, he still comes with some faults and hesitancies. Gus Speth says that many candidates campaign to address climate change but when they are in office, they hesitate to be aggressive on the issue. This fear in 2008 came from believing that "action on climate was going to create huge government; that it was going to drive up energy prices further; and that it was going to make recovering from the recession far more difficult." Speth even says in his opinion, the Obama administration handled climate change poorly and that is one of the reasons climate change denial culture was able to blossom and gain traction in the United States so much. Although we can safely consult with resources such as *Pew Research Center* to figure out that Democratic presidents are more pro-environment than Republican presidents, ideology still plays an important role. Gus Speth says that the fears that the public had with addressing climate change were rooted in the Tea Party movement and also the Republican party, especially in 2010. Speth says, "... a large percentage of Republicans who came into office after that 2010 election were people who were on the record as climate deniers, and now the Congress is full of these people." A report by *Business Insider,* shows over 100 current or recent members of Congress who have doubted, questioned, or outright denied climate change and climate change action. Almost all were Republican in this report with one Democrat and one Libertarian. Whether someone is associated with liberal or conservative ideas can help determine how they view certain issues more than their party identification can. Democrats and Republicans can both believe in climate change but the ideology they identify with can specify their views more specifically. According to *Pew Research Center,* "... ideological thinking is now much more closely aligned with partisanship than in the past. As a result, ideological overlap between the two parties has diminished: Today, 92% of Republicans are to the right of the median Democrat, and 94% of Democrats are to the left of the median Republican."

Just because a president is a Democrat does not mean that he or she will successfully pass laws that help end climate change in the United States. We have seen that although Bill Clinton was a Democratic president, he was seen as one of the less active presidents towards climate change. Bill Clinton was also seen as a more conservative president as he called himself a "new

Democrat."

Pew Research Center reports, "In views of global warming, nearly all Solid Liberals say there is clear evidence that Earth's temperatures have been rising, with 95% saying this is most likely caused by human activity, such as burning fossil fuels." On the conservative side of the ideological spectrum, only about 25% of Core Conservatives believe in climate change. This is a drastic difference between ideologies. There is a less dramatic difference between parties and their views on climate change. For Democrats and Independents leaning Democratic, about 78% think climate change is an issue that needs to be addressed whereas, with Republicans and Republican-leaning Independents, only 21% believe climate change needs to be addressed. These numbers show a clear partisan gap between parties and ideologies which can easily translate to how much an administration addresses climate change in office.

Although it is hard to gauge climate change denial and how it has changed since the 1970s, we can still study climate change action in the U.S. government over the years. There is no clear pattern of administrations becoming more pro-environmental throughout the years since Nixon's presidency. If politicians aren't biased against environmental policy and are worried about addressing it because they think it will harm the economy, then what is the difference between Democratic and Republican politicians? This question and counterargument about the true meaning behind a politician's decision to either pass or not pass environmental policy leads me to believe that it is a political bias from politicians and not an economic worry. Gus Speth says that policymaking for the environment was met with serious bipartisan support but today that is not the case as politics is not as civil as it used to be. Presidents like Ford and Carter built off of the Nixon administration regulations and ideas and set the environment as a top priority. Later administrations like Reagan and even Clinton were not more aggressive than previous presidents and were even seen as weak on the issue of climate change. If the United States is a country that progressively accepts mainstream and liberal ideas, why has there not been a steady pro-environmental administration streak in the White House? Although the United States believes in progressivism, it doesn't show in administrations addressing climate change. Overall, party and ideological alignment are the best indicators of how climate change will be addressed or if it will be addressed at all or dismissed.

Finally, a comparison of action on environmental policy between the United States and Bhutan is necessary to see how the U.S. agenda is different. The United States has administrations that address climate change but for the most part, the U.S. is falling behind in taking care of its contributions to climate change compared to other countries. In a study done by MIT and

reported on by *The Hill,* "Coming in at 40th place, the U.S. finished far behind contemporary nations, with Iceland, Denmark, Norway and France leading the world in first, second, third and fourth place, respectively." I am comparing the U.S. to Bhutan because Bhutan is a recently developed country that has successfully become carbon negative and consistently improves its environmental laws. In 2016, the Prime Minister of Bhutan, Tshering Tobgay, gave a *TED* talk and said, "Of the 200-odd countries in the world today, it looks like we are the only one that's carbon neutral. Actually, that's not quite accurate. Bhutan is not carbon neutral. Bhutan is carbon negative" (Tobgay, 00:07:32). These differences are due to each country's different priorities and factors relating to its economy. Where the U.S. economy is heavily dependent on the energy industry and infrastructure, one of Bhutan's top economic priorities is agriculture and forestry. Bhutan believes in economic growth but not at the cost of undermining their unique culture or their pristine environment (Tobgay, 00:04:11). Although the U.S. has different economic priorities, Bhutan is a small populated country with a much smaller GDP and has still succeeded in listening to scientist-backed recommendations for environmental laws with an even larger achievement of becoming carbon negative. Tobgay says that this balance is easier said than done because they have one of the smallest economies in the world with a GDP less than two billion dollars (00:03:00). It is also important to point out that Bhutan has to offset the pollution of India and China, two of the most polluting countries that Bhutan sits between in Asia. This section is aimed at finding out how far behind the U.S. is in taking care of its contributions to climate change. The U.S. does not exist in a vacuum so it is necessary to compare it to other countries. Many sources show what Bhutan has done to improve their country's environmental protection and how the world can learn from these actions, but how can the United States learn?

Studying climate change in the United States only tells us so much when we are only looking at the United States. Comparing environmental policy and action to other countries can help us find a deeper understanding of what the U.S. is doing right, what it is doing wrong, and whether there are any policies and actions in foreign countries that could help the U.S. as well. Despite the heavy pollution from Bhutan's neighboring countries, they have successfully become carbon negative. Bhutan has been a democratic state since 2007 and has only recently been labeled as a developed country since 2008. Tobgay says in his TED talk, "Our enlightened monarchs have worked tirelessly to develop our country, balancing economic growth carefully with social development, environmental sustainability, and cultural preservation" (00:02:17). There are many odds against Bhutan but they have still succeeded in addressing climate change on an aggressive front. Bhutan addresses climate change so aggressively because a large part of its

economy comes from tourism. Their natural landscapes and nature attract tourism and without this part of their income, their economy would be negatively impacted. Bhutan's economy is very focused not only on tourism but forestry and agriculture.

The United States on the other hand is a developed democratic country with a large industry for tourism as well. The only difference is that there are other industries in the U.S. economy that make up more than tourism such as technology and retail. The economic priorities are different between the U.S. and Bhutan. Environmental policy is also different between the two countries. The U.S. has a federal agency to establish regulations concerning the environment and the U.S. government also passes environmental laws alongside these regulations. Bhutan has environmental laws in their Constitution, a very big difference from the United States Constitution that does not even mention anything related to the environment. This difference in the makeup of the two Constitutions could result from the difference in time periods of when the Constitutions were adopted. In the 1700s, the United States, let alone the rest of the world, was not thinking about climate change but in 2007 climate change was one of the top priorities of developed and developing democratic governments. The Bhutan Constitution says in Article 5 Section 3, "The Government shall ensure that, in order to conserve the country's natural resources and to prevent degradation of the ecosystem, a minimum of sixty percent of Bhutan's total land shall be maintained under forest cover for all time." Although these two countries are very different in their culture, economy, and size, there is always something to learn from each other. The U.S. is frequently compared to other countries with similar economies and GDPs but I think it is necessary to start looking at countries that are different from the U.S. in various ways such as cultural and economic priorities. It is also important to look at these countries that are different in political and economic structures that also have more sophisticated environmental policies. Maybe we have been comparing the U.S. to the wrong countries when it comes to environmental laws. There are official sources from the government of both countries that state their environmental policies but there are not many sources that compare the two governments. Maybe comparing the U.S. to vastly different countries other than the usual countries like France and Germany will bring new ideas to the U.S. for environmental action. We compare the U.S. to plenty of other rich countries but if we find out how countries like Bhutan, with a GDP of under two billion dollars, can successfully become at least carbon neutral then the U.S. can find inspiration and new ideas to adopt. Tshering Tobgay stated that Bhutan prioritized environmental sustainability but they did not prioritize it over their way of life. Bhutan has also successfully balanced its economy with its environment instead of sacrificing one for the other.

Overall, climate change denial is an issue that can be addressed by identifying what fuels it. Although there is no direct link between the timeline of administrations since President Nixon and climate change denial progression or regression, we can still look at party and ideology alignment to find clear distinctions between administrations and climate action. It is also important to note that the comparison between Bhutan and the United States holds many differences. Although Bhutan is smaller in size and economy, it has been able to become carbon negative while dealing with the pollution of both China and India impacting their environment negatively. This is a different situation than what the U.S. is in but it shows that the United States, with more resources than Bhutan, can make a difference by addressing climate change. There are also a lot of holes in studying climate change denial that need to be filled. We can address what fuels climate change denial but once that work is done, we need to find appropriate solutions. There are also gaps with who is considered pro-environmental in the White House. It is not always about party or ideology but there is a combination of the two that can indicate if action against climate change will be taken. Finally, a comparison of the economies, priorities, and governments of the U.S. and Bhutan is necessary to find where the U.S. can improve its climate action. Comparing the U.S. to Germany and England is not always enough to gauge how the United States ranks in environmental law. Although my research is ongoing, I believe that a solution to climate change denial in the United States will be discovered.

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FUROCOUMARIN INGESTION
AND THE RISK OF SKIN CANCER

Furocoumarins are organic chemical compounds found in high concentrations in commonly ingested citrus fruits such as grapefruits and limes (Melough et al., 2017). For more than two decades, dermal application of furocoumarins has been known to form inter-strand crosslinks in DNA in skin cells when exposed to ultraviolet (UV) radiation, causing DNA transcription inhibition, which can be phototoxic and lead to an increased risk of developing skin cancer (Caffieri et al. 1996). While there is a lot of literature on the phototoxicity of dermal furocoumarin application paired with UV radiation, up until recently, little was known about the phototoxicity of furocoumarin ingestion paired with UV radiation. In recent years, several studies linked citrus fruit ingestion to a higher risk of developing skin cancer. Some studies showed a significant statistical link among US adults between a high intake of citrus fruits and an increased risk of developing basal cell carcinoma and squamous cell carcinoma in the skin (Wu et al., 2015). However, other studies showed that citrus fruit consumption and the risk of developing skin cancer are not statistically significant (Melough et al., 2020). Nonetheless, experimentally, some studies have shown that furocoumarin ingestion paired with UV radiation is carcinogenic in both male and female hairless mice (Forbes et al., 1990). These discrepancies in current literature make it hard to determine if a solid link between furocoumarin ingestion and an increased risk of developing skin cancer truly exists.

This review will examine studies that researched the link between citrus fruit ingestion and skin cancer to assess the existing evidence on furocoumarins' phototoxicity when ingested, focusing on the major findings from experimental furocoumarin assessment studies and statistical population studies to determine if there are gaps in research or contradictions among existing literature. Relevant experimental studies include those that determined if there was evidence of furocoumarin ingestion being

phototoxic and studies that focused on determining how furocoumarins are metabolized and how phototoxic they are. Moreover, studies that researched the phototoxic properties of furocoumarins in grapefruits are also significant because grapefruits have antioxidant properties, which is quite contradictory. Statistical studies include those that researched the link between basal cell carcinoma risk and squamous cell carcinoma risk in cohort populations who had high intakes of citrus fruits and studies that linked high citrus fruit ingestion with cutaneous malignant melanoma risk and melanoma history. Determining if citrus fruit ingestion is correlated with a higher risk of developing skin cancer can be beneficial in preventing skin cancer since citrus fruits such as grapefruits are foods that people commonly eat. In order to maintain a high quality of life, it is essential that we know which seemingly harmless factors in our daily lives are causing us harm and are potentially reducing our lifespan.

LITERATURE REVIEW
   1. Possible link between furocoumarin ingestion and skin cancer based on experimental findings
   A. 8-Methoxypsoralen Phototoxicity

Although most studies that showed a possible link between furocoumarin ingestion and the risk of developing skin cancer were published within the last decade, there is a small number of studies that are over 30 years old that researched this topic. One of them is an experiment conducted by Forbes et al. (1990) that studied the phototoxicity of 36 male and female albino mice after ingesting furocoumarin 8-methoxypsoralen (8-MOP). The mice were fed NIH07 mouse food formulation that contained 8-MOP. The control group was fed the same food formulation but without 8-MOP. The study consisted of 4 replicate experiments in which the mice were fed 0, 100,

250, and 635 mg/kg of 8-MOP, respectively. The mice were exposed to UV radiation through UV lamps three times a week, right after the pulse feeding. Changes in skin appearance, body weight, and appearance of skin tumors were recorded weekly. Further analysis of the tissue of these tumors revealed that most tumors were squamous cell carcinoma in nature. This experiment lasted for 52 weeks. The study's results indicated that mice that ingested high levels of 8-MOP and that were exposed to unfiltered UV light had cutaneous carcinogenic damage, which appeared within 20 to 24 weeks after the start of the experiment and had a significant increase in mortality rates. Moreover, mice that only ingested 8-MOP or that were only exposed to UV light neither showed any change in the body weight nor any increase in cutaneous carcinoma and mortality rate.

This study provides evidence that furocoumarin ingestion can cause a type of skin cancer called squamous cell carcinoma when paired with UV light radiation, making this type of furocoumarin phototoxic. The study also provides evidence that furocoumarin ingestion and UV radiation alone were not responsible for any type of skin damage. Therefore, it was concluded that the combination of a high intake of 8-MOP and unfiltered UV light exposure is highly carcinogenic. Nonetheless, the authors acknowledge that the mice were fed an extremely large amount of 8-MOP by clinical standards. Thus, the results might not be applicable to an average human's consumption levels of furocoumarins. Moreover, this experiment was conducted on mice, making the results less reflexive of human interaction with 8-MOP and UV exposure. Overall, this older study potentially provides useful evidence that can help understand which concentrations of furocoumarins are phototoxic and help further prove that ingestion of furocoumarins can be phototoxic when paired with UV radiation.

B. Phototoxicity of furocoumarins in blood after metabolization

Understanding the metabolic pathways that furocoumarins undergo after ingestion is also essential to determine furocoumarins' phototoxic properties. In 2017, Melough et al., involving nine human participants, studied how eleven types of furocoumarins are metabolized following ingestion of grapefruits by identifying and quantifying furocoumarins in the participants' urine and plasma. Before taking urine and plasma samples, participants were instructed to randomly either drink 470 mL of grapefruit juice or 494 g of grapefruit flesh. Blood samples were collected 15, 30, and 60 minutes after grapefruit ingestion and then once an hour for a total of 8 hours. Furocoumarins bergamottin and 6',7'-dihydroxybergamottin (DHB) were present in plasma as early as 15 minutes after ingestion, and they peaked in amount after 30 to 60 minutes. Although furocoumarins were not present in plasma for most participants after 4 hours, furocoumarins were detected 5 hours after ingestion in two participants. Higher concentrations of

furocoumarins in plasma were detected in those participants that consumed grapefruit juice instead of grapefruit flesh, which according to the study, could indicate that furocoumarin absorption is increased when consuming grapefruit juice.

Melough et al. (2017) conclude that citrus fruits, such as grapefruit, can introduce a significant concentration of phototoxic furocoumarins into the bloodstream through absorption when ingested. This study provides evidence that shows citrus fruits can be responsible for carrying certain phototoxic furocoumarins into the bloodstream and into the body. Therefore, not all furocoumarins are excreted; some are absorbed and present in plasma shortly after their consumption. The study, however, uses a significantly low number of participants (only nine participants), which may be difficult to apply to the general population. Ideally, a study that included a higher number of participants from wider age cohorts could provide more accurate results.

While the Melough et al. (2017) study shows how a varied amount of furocoumarins are metabolized, it does not indicate the phototoxicity of the furocoumarins retained in plasma. Previously, Messer et al. (2012) tested the phototoxicity of many furocoumarins such as bergamottin and DHB. In the study, these two furocoumarins and 5-methoxypsoralen (5-MOP) (dissolved in Dimethyl Sulfoxide – DMSO) was added to V79 cells. 5-MOP were added to the solution as a positive control since they are furocoumarins that are known to be highly phototoxic. Cells were then exposed to a UVA dose of 125 mJ/ cm^2. To the negative controls, either only DMSO was added, or they were not exposed to UVA light. The results showed that DHB had low phototoxicity levels compared to 5-MOP, and bergamottin was not phototoxic at the concentrations used in the study.

Melough et al. concluded that although bergamottin and DHB are present in the bloodstream shortly after ingestion of citrus fruit, only DHB could have significant phototoxic properties. Therefore, only one out of the seven furocoumarins tested in Melough et al.'s study shows evidence of being phototoxic. Moreover, the phototoxic properties of DHB are relatively low compared to the positive controls (Melough et al., 2012). It is also important to point out that Messer et al.'s study was conducted on V79 cells, a cell-line originating from Chinese hamsters, which could be different from human cell interactions with furocoumarins. Thus, further studies on the phototoxicity of DHB on human skin cell cultures, such as fibroblast cells, could provide more accurate information on how DHB found in citrus fruits is related to skin cancer.

2. Link between furocoumarin ingestion and skin cancer based on statistical findings

A. Risk of Basal Cell Carcinoma and Squamous Cell Carcinoma

While experimental studies are important because they provide insight into the physiological interaction between furocoumarins and skin cancer, statistical analyses that focus on the correlation between ingestion of furocoumarins and skin cancer risk in population cohorts can provide information on the practical trend between the two factors. A study conducted by Wu et al. (2015a) examined a possible relationship between citrus fruit consumption and the risk of developing basal cell carcinoma (BCC) and squamous cell carcinoma (SCC). The study population in the experiment was made up of two separate ongoing longitudinal cohort studies that consisted of 41,530 middle-aged men and 63,759 middle-aged women who were healthcare workers at the time of enrollment. Participants who had cancer history at the start of the studies or non-Caucasian were excluded. The participants self-reported the quantity of grapefruit juice and flesh they consumed every four years from a range of never to 6+ servings per day. The statistical analysis of the cohort studies' data adjusted variables such as age, hair color, and family history of melanoma. The results indicated a positive trend between citrus fruit consumption and an elevated pooled risk of developing BCC and SCC overall. Participants that had a high citrus fruit intake had an 11% higher risk of developing BCC and a 23% higher risk of developing SCC compared to the mean-risk.

Since the sample size is very large, these results provide more relevant information. However, the authors acknowledge that the subjects are white and wealthy individuals. Therefore, caution needs to be applied when applying these results to the general population. Moreover, the study also points out that BCC diagnosis in the participants was based on the participant's self-reports, and no pathological validation was conducted. This indicates that there is a possibility that many participants may have reported having BCC without being diagnosed by a healthcare professional. As a result, the data for BCC incidence might not be accurate. More studies that include participants from diverse socioeconomic backgrounds and ethnicities can provide better insight into how citrus fruits are related to an increased risk of developing skin cancer in the overall population.

B. Cutaneous Malignant Melanoma Risk and Melanoma History

Other anecdotal human studies have looked at the connection between citrus fruit consumption and the risk of developing other types of skin cancer such as melanoma. In a separate study, Wu et al. (2015b) studied the relationship between citrus consumption and the risk of developing cutaneous malignant melanomas. The study population consisted of two separate ongoing longitudinal studies, which were the same ones used in the study mentioned in the previous section. The study population was made up of 63,810 middle-aged women and 41,622 middle-aged men who were healthcare professions at the time of enrollment. Participants who had a

history of any type of cancer and participants who were non-Caucasian were excluded from the study population. Participants were asked to quantify how much grapefruit and orange flesh and juice they consumed on average every day the previous year from a scale of never to 6+ servings per day. Intake of other vegetables, fruits, and juices was also asked. The participants were asked these questions every two years, starting in 1984 and 1986. The statistical analysis of the collected data was adjusted for variables that can increase the risk of developing melanoma, such as a family history of melanoma, hair color, eye color, exposure to the sun as a child or adolescent, and the number of moles on arms.

The study's results indicated a positive trend between citrus fruit consumption and the risk of developing cutaneous malignant melanoma for both women and men, even when adjusting for variables that increase the risk of developing melanoma mentioned earlier. Participants who consumed more than 1.6 citrus fruits per day had a 36% increased risk of developing cutaneous malignant melanoma compared to those who consumed citrus fruits less than two times a week. Moreover, grapefruit ingestion showed the highest positive trend with the risk of developing melanoma.

As discussed earlier, this study included only white and wealthier participants, and caution needs to be applied in applying these results to the general population. Moreover, melanoma cases were self-reported by the participants and not diagnosed by another healthcare professional, making the data for melanoma incidence less accurate. Nonetheless, the results show a possible causal relation relationship between citrus fruit consumption and the development of melanomas. More studies with participants from diverse ethnicities and socioeconomic backgrounds can provide further insight into the relationship between the two variables for the general population and not a relatively small group of individuals.

FINDINGS

Table 1 summarizes the main findings in each study reviewed in this paper, as well as an interpretation of the findings.

Table 1

Main Findings and Interpretation of Findings in the Studies

Study	Finding	Interpretation
Forbes et al. (1990). https://doi.org/10.3109/15569529009036330	Increased mortality rates when mice were exposed to UV light and ingested high levels of 8-MOP.	High intake of furocoumarin 8-MOP paired with exposure to UV light is highly carcinogenic and causes mortality rates to increase.
	Cutaneous carcinogenic damage 20 to 24 weeks after start of experiment	
Melough et al. (2017). https://doi.org/10.1021/acs.jafc.7b01279	Bergamottin and DHB present in plasma 15 minutes after grapefruit ingestion.	Only furocoumarins bergamottin and DHB are present in plasma after eating grapefruits, and they can stay in plasma for a relatively long amount of time. Grapefruit juice provides higher furocoumarin ingestion in plasma.
	Small number of participants had furocoumarins in plasma up to 5 hours after ingestion.	
	Higher furocoumarin ingestion in plasma for grapefruit juice ingestion.	

Messer et al. (2012). https://doi.org/10.1016/j.fct.2011.11.023	DHB has low relative toxicity at concentrations used in experiment.	Out of all the furocoumarins found in grapefruit juice and those that are found in plasma, only DHB has phototoxicity, and it is relatively low. Bergamottin is not phototoxic at all.
	Bergamottin has no phototoxicity at concentrations used in experiment.	
Wu et al. (2015a). https://doi.org/10.1200/JCO.2014.57.4111	Positive trend between citrus fruit consumption and pooled risk of developing BCC and SCC.	Eating high amounts of citrus fruits increases the risk of developing BCC and SCC compared to the mean risk of developing BCC and SCC.
	High citrus fruit intake leads to an 11% higher risk of developing BCC and 23% higher risk of developing SCC compared to mean risk.	

Wu et al. (2015b). https://doi.org/10.1093/carcin/bgv109	Positive trend between citrus fruit consumption and risk of developing cutaneous malignant melanoma.	High daily ingestions of furocoumarins increase risk of developing cutaneous malignant melanoma. Moreover, grapefruit ingestion leads to higher risks of developing cutaneous malignant melanoma.
	Ingestion of more than 1.6 citrus fruits per day increase risk of developing cutaneous malignant melanoma by 36%.	
	Grapefruit ingestion has highest positive trend with risk of developing melanoma.	

Note. UV = Ultraviolet. 8-MOP = 8-methoxypsoralen. DHB = 6',7'-dihydroxybergamottin. BCC = Basal cell carcinoma. SCC = Squamous cell carcinoma.

ANALYSIS

Experimental studies

Out of the three experimental studies reviewed in this paper, only one of them indicates a strong relationship between furocoumarin ingestion and an increased risk of developing skin cancer. The Forbes et al. (1990) study provides evidence that mice that ingested furocoumarin 8-MOP and were exposed to UV light had higher mortality rates and developed cutaneous carcinogenic damage. This information indicates that ingestion of furocoumarins can be phototoxic. However, mice ingested a significantly higher amount of furocoumarins relative to normal levels of consumption of citrus fruits by humans. Hence, this study is relatively less relevant to humans.

Although Forbes et al. (1990) provide evidence that large amounts of 8-MOP ingestion can be phototoxic, a later study by Melough et al. (2017) showed that out of the eleven furocoumarins found in grapefruits, only furocoumarins DHB and bergamottin are found in plasma after ingestion. Therefore, only DHB and bergamottin have the potential to be phototoxic. That is because furocoumarins would only become phototoxic when exposed to UV light. If furocoumarins travel through blood vessels

throughout the body where they can be exposed to UV light, they can then become phototoxic. Therefore, Forbes et al. (1990) findings are less relevant to establish a relationship between human ingestion of furocoumarins and an increased risk of developing skin cancer since phototoxic 8-MOP is not found in plasma after ingestion of citrus fruits.

In the *in vitro* experimental study, Messer et al. (2012) assessed the phototoxicity of furocoumarins in V79 cells (a Chinese hamster cell line). The study concluded that DHB has low relative phototoxicity and that bergamottin is not phototoxic. Therefore, out of the two furocoumarins found in plasma after citrus fruit ingestion, only one of them (DHB) is mildly phototoxic.

Overall, the experimental studies do not provide enough evidence to link natural ingestion of furocoumarins to an increased risk of developing skin cancer. Despite furocoumarins being found in plasma after citrus fruit ingestion, none of those furocoumarins are highly phototoxic. Although 8-MOP is phototoxic in mice, it is only phototoxic when ingested in extremely large amounts, which is not reflective of human's ingestion of furocoumarins. Moreover, two of the studies used non-human samples, which further compromises the relevance of the results in human interactions with furocoumarins.

Statistical studies

Two statistical analyses involving human subjects reviewed in this paper showed a positive relationship between ingestion of furocoumarins and an increased risk of developing skin cancer. The study conducted by Wu et al. (2015a) showed that in a longitudinal cohort study, participants who ate a larger amount of citrus fruit had a higher percent risk of developing BCC and SCC. Similarly, in another study by Wu et al. (2015b), participants who consumed more than one citrus fruit a day had an elevated risk of developing skin cancer. These results show a positive trend between ingestion of furocoumarins and the risk of developing skin cancer.

Although both studies have large sample sizes, which increases the accuracy of the results, the nature of participant selection makes them relatively less useful to draw conclusions applicable to the general population. Both studies used data from affluent white participants, as well as relied on self-reported data from participants (which was only verified by a physician in one study). These two factors make the studies lack validity since the results do not represent the average population, and self-reports can be erroneous. Despite these concerns, both studies show consistent results of a positive trend between ingestion of furocoumarins and the risk of developing skin cancer.

CONCLUSION

Statistical studies reviewed in this paper show a significant positive trend between citrus fruit ingestion and the risk of developing skin cancers such as BCC, SCC, and cutaneous malignant melanoma. On the other hand, experimental studies show that while some furocoumarins such as 8-MOP have high phototoxic properties, out of the furocoumarins found in citrus fruits that are ingested by humans and that are metabolized into plasma, only one of them, DHB, has phototoxic properties which are relatively low compared to other furocoumarins. Therefore, there is insufficient experimental evidence that shows a physiological relationship between furocoumarins ingested in citrus fruits and the risk of developing skin cancer.

FURTHER STUDIES

Since there is not enough experimental evidence to support the statistical evidence, further experimental studies that study the link between furocoumarins, such as DHB ingestion and risk of developing skin cancer, can establish a connection between the two factors since, if not supported by experimental evidence, the observed statistical evidence could be attributed to other variables.

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MARCHING BAND
AND LOWER APPENDICULAR INJURIES

The lower appendicular musculoskeletal (MSK) system works to support the body by providing stability and facilitating movement. Injuries to this system can range from slight to severe; they may disrupt daily activities or detrimentally affect an individual's quality of life. While athletes are more commonly subjected to MSK injuries, other physically active individuals and their injuries can be overlooked; this includes marching band participants.

Marching band is a high school, collegiate, and independent team-based physical activity. It originated as an accompaniment to battlefield, but the first entertainment band was founded in 1846 at the University of Notre Dame. Today marching bands are coordinated and precise movements of music, visual sets, and body motions that portray a theme; these shows take months of preparation. Color guard (flagline) demonstrates synchronized choreography through spinning weapons and flags and dancing as a visual component for viewers. Marching bands are typically the halftime performances at football games, but they also participate in competitions outside of football games. While marching band is not formally classified as a sport, it has evolved into a highly choreographed and competitive athletic art, requiring physical endurance, strength, and flexibility (Rhode, 2017).

Physical exertion

Marching band requires intense physical exertion with elevated biomechanical demands and time commitments (Hatheway & Chesky, 2013). Participants in marching band perform highly choreographed and competitive routines that require endurance as well as strength, conditioning of the heart and lungs, and flexibility while carrying equipment and blowing air through instruments for eight to twelve minutes straight (Geier, 2021).

Marchers frequently engage their hips, knees, and ankles in a structured and technical way. This includes the dynamic loading activities of

marching itself, the static loading brought on by maintaining a position for prolonged periods, and visuals such as lunging, squatting, and hip flexion and extension required in visuals. While participants transport their bodies in organized and patterned movements through marching forward and backward, sliding left and right, and moving obliquely to create an overall "form" or picture on the field, they also engage in "visuals," or bodily motions and dance moves that add variation and creativity to a movement. Visuals may also be used to describe the overall picture created through movement or the role of the color guard in adding color and eye-catching representation of music. Visuals require cardiovascular capabilities, strength, and flexibility to complete (Quillen, 2021).

During marching season, participants are continuously exposed to stressors that can cause injury if they are not prepared or treated properly. The varied types of marching and visuals of marching band shows require musculoskeletal exertions from the body. Hip flexion is utilized to forward march and extension to backward march. Ankle dorsiflexion is needed to have proper technique for the marching style of high toes, and plantarflexion of the ankle assists in halting and direction changes. The hip is rotated internally and externally to implement direction changes as well (Quillen, 2021).

Muscles must be able to support these movements; these include the quadriceps, hamstrings, calves, the tibialis anterior, and gluteals (Quillen, 2021). The quadriceps affect both the knee and hip by functioning in knee extension, hip flexion, posture maintenance, the stages of gait, and patellar stability (Bordoni and Varacallo, 2018). The hamstrings and gluteal muscles are drivers of hip extension, and their coordination stabilizes the pelvis during activity (Higashihara et al., 2019). The calves work to plantarflex the foot and ankle; they are engaged in walking and running (Binstead et

al., 2021). The tibialis anterior is the foot's strongest dorsiflexor, which is essential in gait because it moves the foot off the ground in the swing stage; the tibialis anterior is also a powerful foot inverter and supports the medial longitudinal arch in the foot (Juneja and Hubbard, 2021).

Scholars argue that, whether marching band should be considered an official sport or not, it should be recognized for the amount of physical activity it requires, and there should be guidelines protecting participants (Geier, 2021).

Marching band and health

Band members take approximately 13,987.8 steps on game day and 8,337.5 steps on practice days (Cowen, 2006). The amount of activity varies among bands of different sizes, competition levels, and marching techniques (Valle & Leander, 2013), but the energy demands of marching band classify it as a moderate activity on average (Erdmann et al., 2003). It has also been shown to improve cardiorespiratory fitness (Valle & Leander, 2013). Though marching band is an overall benefit to the health of practitioners, understanding marching band as a physically demanding activity helps highlight the prevalence and type of injuries. Examining these injuries in greater detail provides more insight on why certain injuries occur more frequently.

Injury

The patterned movement of the musculoskeletal system may subject individuals to injuries throughout a season. When participants of marching band are not deemed athletes, they are not provided with the same level of attention in terms of physical health and training. Without proper training or conditioning, participants may implement a marching or visual movement incorrectly or at frequencies and speeds to which their body is not accustomed. While this may lead to injury, if not treated properly, they can become more serious acute or chronic injuries overtime.

The cause and prevalence of marching band injuries is not reported in detail in literature What types of injuries do marchers obtain and how are they obtained? What treatments and prevention methods may diminish the risk of injury? Through a review of literature and analysis of supplemental interviews, this paper presents data on the prevalence, type, and cause of injuries among marching band participants while offering possible preventative methods. It demonstrates that marching band participants obtain and maintain lower appendicular injuries due to overuse and insufficient preparation for marching band activities. These injuries are patterned and significant; they are reflections of the lack of care taken for marching health. This paper examines the types and prevalence of injuries in an effort to increase understanding on their nature, bring more awareness to their patterns, and encourage preventative action.

CURRENT PRACTITIONERS

Methods

For the interview portion of the study, 10 individuals were surveyed and interviewed about their marching band experiences; this totaled 21 different high school and college marching band experiences, averaging about two experiences per person. These individuals came from a variety of band and section sizes. The band sizes ranged from 40 to 200 people, and the sections ranged from two to 30 people. Each individual had at least four years of experience in marching band. The surveys conducted for each experience focused on the size of an individual's band and section, how many days and hours they practiced each week, if they worked on marching technique and physical conditioning, how much time and focus was spent on each, and if they obtained an injury related to marching. The interviews expanded upon the injuries, focusing on how they were obtained, how long they persisted, if they affected marching, and how long it took them to resolve. These results are a product of self-reporting.

Results

The average amount of time spent in a high school marching band per person was 3.9 seasons, and the average for college was 1.6 seasons. Of 10 individuals, eight played the same instrument or used the same equipment for all experiences; two played different instruments or used different pieces of equipment for each experience. Of the eight who played the same instrument or used the same equipment, one was a percussionist (bass player), three were in color guard (flag), one played flute/piccolo, two played mellophone, and one played sousaphone; one individual played clarinet for one experience and bass drum for another; one individual played baritone saxophone for one experience and bass drum for another. Practices ranged from two to five practices a week and two to 16 hours a week.

Sixty-six percent of experiences involved some form of conditioning; 14% were personal choices, 64% were mandatory conditioning at practices, and 22% were both. Each individual that participated in personal conditioning ran; 40% also practiced with squats, 20% with sprints, and 20% with calf raises; 20% additionally worked with dance classes. This averaged 6.9 hours per week. Of those who conditioned as a mandatory part of practice, 62% indicated it involved running; 25% did calf raises; 42% did squats; 58% did lunges; 33% did high knees; 8% did karaoke exercises; 17% worked with suicides; 8% did butt kicks; 17% did sprints. This averaged 37.75 minutes per week spent on conditioning.

Ninety-five percent of participants indicated that they worked on marching technique at practice, averaging 90.25 minutes each week. All these individuals worked on forward and backward marching as a part of technique. 80% worked on slides; 60% worked on jazz running; 50%

worked on across the floors; 70% worked on halts; 90% worked on 8 to 5s; 40% worked on 4 to 5s; 10% worked on 6 to 5s; 5% worked on 8 by 8s; 45% worked on hip shifts; 35% worked on 12 to 5s; 40% worked on 16 to 5s; 35% worked on obliques; 45% worked on jazz walking; 5% worked on crab marching; 15% worked on 32 to 5s; 5% worked on 64 to 5s.

The average amount of movement in a show was a 7.57 on a 1-to-10-point scale, 1 being a standstill band and a 10 being constant movement and no halts. The average amount of visuals in a show was a 5.81 on a 1-to-10-point scale, 1 being no visuals and 10 being at every halt.

Injury rates.

Eighty percent of people noted at least one lower appendicular injury in their marching career. 60% noted at least two injuries. 20% reported three injuries. Of those who reported an injury, 62.5% noted a knee injury; 75% of people noted an ankle injury; 50% noted a hip injury.

Individual experiences.

One individual noted knee and hip pain brought on by running during shows and band visuals; both persisted into later seasons in addition to an ankle pain. These impacted marching in that the individual had to sit out of activities, and they still struggle with pain years later. A second individual with combined hip and knee pain developed these issues in response to crab walking and carrying a drum; the weight of the drum pushed down, placing strain on the legs, and crab-walking heightened the impact.

Another individual noted knee pain that was accompanied by ankle pain; the knee pain was brought on by floating kneecaps and ankle pain by pronation. These both persisted into later seasons and influenced the development of hip pain, leading to a need for supportive braces years later for the knees and ankles. Both ankle injury and knee pain were reported by another participant who rolled their ankle during marching band visuals and injured their knee through repetitive dance and lunging motions during shows. The ankle injury resolved, but the knee injury persisted; they still struggle with popping and painful knees years later and use pain medication and braces as needed. A third individual experienced combined ankle and knee pain; in this case, it was brought on by marching activities and the lack of rest between practices; the pain becomes more noticeable during marching season and fades away once the season is over. While it does not impact marching abilities, the pain is persistent. A single case involved only ankle pain, without accompanying knee or hip pain, that was brought on by misstepping during marching; however this injury did not persist but for a few days.

Two more serious injury cases were reported. One was a sprained ACL (Anterior Cruciate Ligament); this was cause by a fall during the execution of a visual and is a pain still struggled with today. One participant

experienced injury to all three areas; they obtained a fractured and sprained ankle caused by misstepping during backward marching; this injury resolved but flares up years later. The knee injury was brought on by dancing and still must be treated with a brace or kinesiology tape. Lastly, the hip injury was caused by misstepping on the practice band field but did not persist.

Correlations.

Of initial injury experiences, 62.5% had mandatory conditioning at practice, 25% practiced both personal and mandatory at-practice conditioning, and 12.5% did not condition at all. Of injuries that persisted in a second marching experience, 60% had mandatory conditioning at practice, 20% did not condition, and 20% did both personal and mandatory at-practice conditioning. Of initial injury experiences, all practiced marching technique. Of injuries that persisted into a second marching experience, 80% practiced marching technique. There were no patterns of injury based on the type of marching technique or conditioning practiced with this sample. Injuries and types of injuries were not strongly correlated to how much one practiced each week or to how much movement or visuals were in a show.

Injury treatment and prevention.

Forty-two percent of participants noted band parents and band moms were responsible for providing ice, wraps, and pain medication as needed for any injuries. 25% were told to deal with it themselves; 8% had a volunteer student team; 17% used the school sports trainer; 8% went to the color guard instructor. Participants argued that the best way to prevent injury is to focus on technique and the body, drink plenty of water, and know one's limits. They also noted that having braces and tape for support is useful. In addition, they advise to take marching seriously.

ANALYSIS

Based on the surveys, injury rates did not strongly correlate with rehearsal times, type of conditioning and technique practice, or marching and visuals, but they did correlate with the presence of conditioning and technique focus. Of those that reported injury, most physically conditioned and all worked on technique. This indicates that many marching band injuries arise from overuse and fatigue, meaning participants overwork their musculoskeletal system and do not allow the proper amount of time for it to recover before repetitions.

Based on the interviews, however, injuries, especially those to the ankle, arose from misstepping during marching. While this is not indicative of the lack of technique during marching and could solely be the effect of an accident, misstepping is characteristic of less technical practice and suggests that implementing proper technique is significant in injury prevention. However, this cannot be fully supported by the data presented here.

The rate of injury based on the data demonstrates the prevalence of injury among marchers; the surveys and interviews indicate that these injuries are patterned. Injuries typically occur in the form of generalized ankle, knee, and hip pain. Rare injuries reported, however, include fractured and sprained ankles, sprained ACLs, floating kneecaps, and cracking or popping knees; more generalized pain is more common, though. Each of these were brought on by marching activities, including running, visuals, marching, dancing, and bearing the weight of an instrument or piece of equipment.

Most injuries were sustained from drum line and color guard. Drummers more frequently reported knee and hip pain, and color guard members noted knee, hip, and ankle injury and pain. This pattern is consistent with expectations related to mechanical loading during activity, since drumline members carry heavy equipment strains their lower back while also marching in a different style from the other band members. Color guard injuries are more prevalent because they are more likely to engage in dance-like movements and must jazz run throughout the show, putting more strain on their lower body and its joint systems.

It is important to consider the sample size; here, the small size may be limiting in showing the correlation of injuries to type and time spent on conditioning and technique. While this data does not support the argument that increased strength training and technique focus would decrease the prevalence of injuries, a larger sample size with a wider range of individuals and experiences may show this. Because of this, additional data was collected from previous surveys and samples of marching band participants across the country to provide more information and perspective on the prevalence and types of injuries among marchers.

MARCHING BAND INJURY RATES FROM PREVIOUS STUDIES

Musculoskeletal injury (MSI) is prevalent in collegiate marching band and color guard members (Beckett et al., 2015). This prevalence differs from study to study though. Becket and colleagues reported a 25% musculoskeletal injury rate among marching band members, 87.7% of which were to the lower limbs (2015). In a study with the Baltimore Colts Band, 22% of musicians and 35% of the flagline reported pain or stiffness in the lower extremities; 23% reported a problem that affected their performance and participation in band activities (Harmon, 1993). Rhode et al. found a 25% injury rate among marchers, 22.6% of which were to the ankle (2017). Of Dr. Gary Granata's study of Indiana's Avon High School marching band (2008), 38% of members suffered an injury after practice, and 95% reported stiffness and soreness (Geier, 2021).

A 2005 report on a band camp clinic found that 178 students visited a marching band health clinic 378 times across the entire camp (Kilanowski, 2008). A similar study in 2006 reported 596 visits from 224 students

(Kilanowski, 2008). The chief complaint in these studies was injury to the lower musculoskeletal system (Kilanowski, 2008).

Females were 20% more likely to sustain a musculoskeletal injury (Beckett et al., 2015). The flagline reported higher numbers of physical ailments than other band members (Harmon, 1993). Injury risk at band camp ranged from 150% to 188% across two seasons (Rhode, 2017). In addition, only 30% of band members reported seeing a physician for pain or injuries (Harmon, 1993).

One of the most extensive studies conducted on marching band injuries was with the University of Michigan Marching Band. Mehler and colleagues conducted research on marching band injuries here in 1995 to show the prevalence of marching injuries (1996). The University of Michigan Marching Band is an intense high-step Division I marching band, and this technique makes members prone to injury (Mehler et al., 1996). Data collected across one season included 179 injuries out of 337 members (about 53.1% of members), the majority self-limiting, and 85.5% of those (153 injuries) were of the lower extremities. The highest rate of injury was in first year members, but the rate of injury decreased with increased experience levels; most injuries were sustained by first year members. Approximately 67.6% of injuries were obtained from high step marching, one percent from gliding, and about 2.8% from both; 28.6% did not specify what led to their injury. 34% of injuries were pre-existing; 11.2% of those used kinesiology tape or braces to support their current activities (Mehler et al., 1996).

Piccolo and tuba players had proportionately higher rates of injury; color guard had the third highest prevalence. Of the injuries reported, 35.3% were of the ankle, 22.2% of the knee, 20.9% of the foot, 5.2% were shin splints, and 2.6% were pulled or strained hamstrings. Achilles tendinitis, shin problems, and calf pain represent two percent each. A high proportion of injuries were obtained in the pre or early season, reflecting lack of preparation and poor practicing conditions; as the season progressed, fitness and technical skills enhanced, and the injury rate decreased. Mehler and colleagues determined that the higher rate of injury in first year members demonstrates unfamiliarity with the physical demands of marching (1996). Injuries were also affected by an asphalt marching surface; injuries would likely decrease if practices were held on a more shock-absorbent surface. Most injuries are related to the rigor of practice and the marching style as well as the marching surface and attire (shoes) worn (Mehler et al., 1996).

Injuries arise primarily from tension and fatigue from repetitive motions of marching, flawed biomechanical implementations, and sudden increases in intensity and repetitions. Most injuries from marching originate from overuse, when the body is not given enough time to adjust to added stress; this causes muscles and tendons to break down (Quillen, 2021). Risk

increases when there is inadequate stretching and preparation or rest and treatment following a injury (Michigan Marching Band; Quillen, 2021). The lack of proper training and technique application drives these overuse injuries. Without conditioning or the sudden increase in exercise, overuse injuries will occur. The demands of marching themselves lead to injury, including long rehearsals and repetitive movements (Quillen, 2021). While some pain and soreness is normal, if left untreated, they will become serious injuries (Quillen, 2021).

Example: color guard and knee injuries

Marching Health determined that knee problems are prevalent among color guard members (2020). This has been observed across multiple marching bands as a pattern. Marching Health scholars determined that some injuries are due to trauma, which is unavoidable, but most are due to overuse, which is preventable. Patellofemoral pain is linked to hip weakness, including weak hip extensors, abductors, and external rotators, as well as flat feet from underlying conditions and unsupportive shoes. Most guard members also sacrifice stability for flexibility by over-stretching their joints during warm up and practices (Marching Health, 2020). Prevention can reduce the rate of knee injury, including strengthening the core and leg muscles, as well as proper training and education in color guard technique (Marching Health, 2020; Peterson et al., 2014; Boiling et al., 2010; Leetun et al., 2004).

Synthesis

The prevalence of injuries ranges from 22% (Harmon, 1993) to 53.1% (Mehler et al., 1996), most of which were to the lower extremities. Many also reported a higher rate of general soreness, stiffness, or pain than injury after practices. They each demonstrate the presence of marching band injuries among members, for varying types of marching groups. The likelihood of obtaining an injury increases with the lack of training and preparation that conditions the body to marching conditions in addition to overuse from repetitive motions and little rest between repetitions. A less shock-absorbing practice surface, like asphalt, and less supportive shoes also increase the chance of injury.

MARCHING BAND INJURIES

The quadriceps, hamstrings, hip flexors, calves, tibialis anterior, and gluteals are the most frequently used muscles and muscle groups that are more susceptible to injury (Quillen, 2021). Typical injuries include sore muscles, inflamed joints, fatigue and repetitive-use injuries, and strained muscles (Michigan Marching Band; Rhode, 2017; University of New Hampshire Bands, 2020). Other common injuries are shin splints, Achilles tendinitis, and generalized pain (Quillen, 2021; University of New Hampshire Bands,

2020). Acute injuries may include sprains, especially those to the ankle and knee (Michigan Marching Band; NATA, 2020). Though little research has been conducted on these rates, the data that have been collected reflects a strong correlation between marching activities and injuries that is significant.

Sore Muscles

There are two types of sore muscles, transitory and delayed onset muscle soreness (DOMS). Transitory occurs during or immediately after exercise, and DOMS is usually felt about a day after exercise (Smith et al., 1992). Transitory soreness is caused by a buildup of fatigue products, like lactase, that prevent actin and myosin from forming cross bridges (Smith et al., 1992). DOMS, however, is more commonly experienced.

DOMS is primarily caused by eccentric, negative muscle action when the muscle is lengthened while also producing tension and is more likely to occur during strenuous exercise (Miles and Clarkson, 1994; Smith et al., 1992). Eccentric refers to movement in the direction of gravity; for example, downhill running would involve more braking and therefore more eccentric movement, increasing DOMS. Crouching positions, spring-like activities, and bending are also more eccentric. Contractions of the muscle cause minor injuries to it and surrounding connective tissue, leading to unaccustomed eccentrics that produce tissue disruption during exercise (Smith et al., 1992). Damage to muscles causes an inflammatory reaction leading to lost strength and reduced motion (Miles and Clarkson, 1994).

DOMS is only experienced with movement or palpation; it will increase within 24 hours, peak between 24 and 72 hours, and subside in five to seven days at most; it is one of the most common sport injuries. Sore muscles can range from muscle tenderness to severe pain; they are typically more prevalent at the beginning of sporting seasons when athletes return to activity or when athletes are initially introduced to a specific activity; newer exercises performed at greater frequency and intensity are more likely to cause micro-injuries that induce sore muscles (Hume, 2003).

Inflamed joints

Inflamed joints involve damage to the cartilage in joints that leads to degeneration and loss of function and stability via the development of swollen and painful joints (Kim et al., 2017; Villines, 2021). Synovial joints, like the knees and hips, are the most common joints involved and have a more complex structure than other joint types in the body; they allow circular and angular movement at greater degrees. They include the synovial membrane that lines the joint capsule, the synovial fluid that lubricates and provides shock absorption for the joint, and the articular cartilage that covers the bone ends and reduces friction. Loss of articular cartilage leads to inflamed joints (Casey, 2015).

Mechanical damage is the leading cause of joint inflammation via

damage to articular cartilage. If cartilage is damaged by repeated stress causing micro-trauma, breakdown products trigger immune cells and generate inflammation. The inflammatory process stimulates repair and ends in reduced pain and stiffness in many people, however, if inflammation is not regulated, joint cartilage will continue to break down and deteriorate, leading to osteoarthritis (Casey, 2015).

Fatigue

Fatigue is physical exhaustion associated with prolonged exertion or stimulation; it prevents an individual from maintaining the level of force after increased use (Slobounov, 2008). Fatigue refers to tissue damage buildup and the loss of strength and stiffness brought on by loading. Mechanical fatigue leads to overuse injuries, and starts on the level of tissues (Edwards, 2018). Mechanical fatigue is caused by microdamage from repetitive loading. This damage differs depending on the tissue and the type of loading. Bones, for example, may develop linear cracks (0.05 to 0.1 millimeters in length) or diffuse clusters of cracks (less than 0.01 millimeter); tendons present kinked fibers, dissociations, or ruptures (Edwards, 2018).

While damage to tissues normally induces adaptation via remodeling, without adequate rest, increased activity will bring more damage and eventually failure (Edwards, 2018). Fatigue will then subject muscles to strains and fractures, especially under high-intensity eccentric loading (Edwards, 2018; Mair et al., 1996).

Strained muscles

Strained muscles are also referred to as pulled muscles. They occur as injury to muscles or the band of tissue that attaches muscle to bone. Strained muscles occur as partial tears that damage a muscle's internal structure; these tears can range in size and can be small or severe. They are most frequently caused by physical incapacity; this is in the form of tension that a muscle cannot bear either because it is not prepared, because the tension is too much, or because the muscle is fatigued (Fernandes et al., 2011; Leach, 2008). Muscle strains occur as a product of forcibly stretching a muscle, usually during an eccentric contraction (Guermazi et al., 2017). Eccentric contraction decelerates the joint to absorb force or control the lever (Smith, 2007). Muscles most at risk are those in which the insertion and origin of the muscle crosses two joints; while these have greater contraction velocity and capacity to lengthen, they are less resistant to tension (Fernandes et al., 2011; Leach, 2008).

Strains are categorized into three grades. Grade 1 involves no significant tissue tears and less than five percent loss of strength and function. Grade 2 features myotendinous junction (MTJ) damage and further loss of strength and function. Grade 3 is a complete tear of the MTJ, loss of function, and often the presence of a gap (Guermazi et al., 2017). Unless the

tears are severe, they resolve without residual disability; with severe tears, however, sometimes surgery is required (Smith, 2007).

Shin Splints

Shin splints, or medial tibial stress syndrome (MTSS), are an overuse injury seen most often in runners (Menendez et al., 2020; Tolbert and Helen, 2009). Though the exact cause of MTSS is unknown, it is correlated with running kinematics and overpronation of the foot (Menendez et al., 2020). Hard training surfaces and muscle imbalance can also induce the injury, but shin splints are more frequently the result of improper techniques and increasing intensity too quickly (Tolbert and Helen, 2009).

There are two theories to the underlying cause of MTSS. The Fascial Traction Theory argues that tension through the plantar flexors causes traction at the deep crural fascia (DCF; a thick connective tissue) attachment to the periosteum. During running stance, eccentric loading of muscles, especially of the soleus, influences the accumulation of tension; this likely occurs as an attempt to counter pronation motions or in reaction to fatigue (Monaro, 2015). The second theory, the Bone Stress Theory, follows Wolff's law that stress results in skeletal adaptation, but, if the stress is beyond repair, it causes microdamage that accumulates past reparation. Bone resorption occurs faster than replacement. MTSS is this a stress reaction of bones that causes pain; this is the most supported theory of MTSS (Monaro, 2015).

Achilles tendinitis

Achilles tendinitis is inflammation of the Achilles tendon, or the tissue connecting the calf muscles to the heel bone The tendon is engaged in walking, running, jumping, and calf raises. Inflammation most frequently arises after increased intensity and duration, especially in running (Mayo Clinic Staff, 2021). Most Achilles tendon injuries are associated with paratenonitis, the inflammation of the membrane-like structure of tendons. The remaining issues involve insertions, such as bursitis and insertion tendinitis, as well as pain of the MTJ and tendinopathies (Kvist, 1994).

Pain is typically a mild ache in the back of the leg or above the heel, but more severe pain can occur, along with stiffness. More serious cases can lead to tendon tears. It generally resolves with rest but can also be prevented with gradual increases in activity, the right shoes, stretching, and cross-training (Mayo Clinic Staff, 2021).

Sprains

Sprains are injuries to ligaments, the connective tissue joining bones and stabilizing joints during movement. Sprains are caused by force being applied to that ligament. When the force applied exceeds the ligament's tensile strength, it leads to tearing; this typically occurs when the joint is twisted. Similar to strains, sprains can range from a grade 1, characterized by

a stretching without a tear, to a grade 3, which is a completely torn ligament (Canares and Lockhart, 2013).

The most common sprains are to the ankle, most notably lateral ankle sprains (LAS) resulting from damage to the ligaments of the ankle caused by forced ankle plantarflexion and inversion (Canares and Lockhart, 2013; Hubbard and Wikstrom, 2010). The first ligament to be injured is the weakest, the anterior talofibular ligament (ATFL), followed by the calcaneofibular ligament (CFL) and the posterior talofibular ligament (PTFL) (Hubbard and Wikstrom, 2010).

Sprains also commonly occur to the knee, most commonly to the anterior cruciate ligament (ACL) (Canares and Lockhart, 2013; Siegel et al., 2012). The ACL controls tibial movement and inhibits its rotation (Siegal et al., 2012). A sprained ACL is caused by deceleration, jumping, or cutting characterized by direction changes involving rotation or lateral bending or hyperextension (Canares and Lockhart, 2013; Siegel et al., 2012).

DISCUSSION

This research shows that injuries among marching band participants are not only present but also patterned. Because the lower body is most frequently engaged in movement throughout practices and shows, most notably the hip, knee, and ankle joints, participants are susceptible to injury in these areas. Injuries may be inflamed joints, fatigue injuries, strains, or generalized pain but can also include shin splints, Achilles tendinitis, and sprained ankles and knees.

The data collected from current practitioners more strongly supports overuse and fatigue as the leading cause of injury in marchers, however the interviews suggest that applied technique in stepping would decrease injuries as it decreases the prevalence of misstepping. The data from previous surveys and samples as cited in research suggests that technical focus and rest between repetitions and practices decreases the prevalence of injury. Physical conditioning allows individuals to strengthen their lower appendicular MSK to prepare it for the intensity of the activity. Practicing technique can ensure that individuals implement the proper movements when marching or performing dance and visual aspects of a marching band show. Resting allows the body to heal so its systems do not become fatigued and further susceptible to injury. Rather than focusing on the treatment of these injuries, prevention methods can be implemented to reduce injury rates.

Prevention

Injury is less likely to occur if proper training is implemented prior to the marching season and each practice. Changing technique during repetitive motions is dangerous for marchers so mastering technique is vital to protect against injuries (Quillen, 2021). This can be accomplished early in

the training and education processes of marching band camps and practices. Because of the risk of injury from lack of training, marching athletes need proper preparation and guidelines to minimize risk of overuse injuries (NATA, 2020).

Marching Health.

Previously, there have not been many resources for marching band directors and staff on training participants and preventing injuries, but, in recent years, more attention has been brought to the prevalence of marching injury, leading to an increased awareness of the problems and an increased push for better resources and guidelines. One such resource that offers training advice and structure for directors, conditioning and exercise regimens for performers, and general guidelines for all marching arts is the Marching Health organization. The Marching Health website is a training resource for the marching arts, whether drum corps, indoor, high school, or collegiate, tools to properly prepare for marching season (2020). This involves advice on movement, information on skills, and education on health and the body. The organization is managed and supported by professionals in athletic training, biomechanics, and ergonomics. The Marching Health website and its staff have received high praise from numerous organizations. Jim Coates, the executive director of Carolina Crown states that the resources provided are a valuable asset to drum corp groups (Marching Health, 2020). Mike Scott, the CEO of Bluecoats, argues that their partnership with Marching Health brings them the necessary care and expertise they need (Marching Health, 2020). Mark Perrett, the Grid Book Percussion CO-Founder says it is "revolutionizing health and wellness pedagogy within the marching arts. As the activity evolves, so should its methods" (Marching Health, 2020). The Marching Health website is cited in this paper because of its validity and reliability in the marching arts and medical health industries.

National Athletic Trainers' Association Guidelines.

Another resource for marching band preparation and injury prevention is the National Athletic Trainers' Association. NATA is a professional association for athletic trainers that offers guidelines for athletic organizations to promote safety, health, and well-being. Because of the prevalence of injuries in marchers, NATA has outlined several guidelines to ensure the safety of marching band members:

1. Prepare for the activity: This involves having a physical as well as information on file about the individual's health concerns.
2. Have an emergency plan: This is an action plan for when injuries occur and should include staff assignments and equipment and supplies needed.
3. Ready members to march: This is a conditioning plan for participants that ensures they are physically and mentally prepared for marching activities; it includes stretching, warm-ups, and exercising to increase strength and

flexibility.

4. Promote core strength and good posture: This involves exercise plans that promote strength and stability.

5. Attire: Supportive shoes are required along with proper clothing for the weather conditions.

6. Proper Technique: Lack of education and training in the proper methods of marching and choreography can easily lead to ergonomic injuries; technical training should not be neglected.

Trainers.

These organizations recommend having a first aid trained member on staff, files on participants' health information, and required conditioning and exercise programs for members (Harmon, 1993). Medical staff are needed to prevent and treat injuries in marching band (Mehler et al., 1996), and certified athletic trainers can reduce the risk of and treat injuries from marching (Rhode, 2017).

Athletic trainers can reduce great public health concerns by working early with adolescents. They can manage the condition, alleviate maladies, and provide advice and care. The National Athletic Trainers' Association for directors suggests guidelines would reduce injuries in marching members, but directors are not always able to implement them. Directors rarely have knowledge about biomechanics and ergonomics to ensure guidelines are properly followed. An athletic trainer would be a source of education on the body, injury prevention, and treatment (Rhode, 2017).

Directors and members.

Scholars suggest that directors move practices onto more forgiving fields with greater shock absorption; injuries would likely decrease if practices were held on a more shock-absorbent surface rather than on hard surfaces such as asphalt. Individual efforts may also be taken to prevent injury; members need to wear supportive shoes with shock absorption, flexibility, rigid heels, and supportive insoles. Protecting previous injuries would also decrease the injury rate; this may include wearing braces, wraps, and kinesiology tape during practices and performances (Mehler et al., 1996).

CONCLUSIONS

Injuries are prevalent among marching band members because of intense and strenuous activity executed at great frequencies or without proper technique. Research on the physical ailments of marching band members increases awareness about their problems. If more research is conducted on marching injuries, it will demonstrate the importance of proper technique, sufficient training, biomechanical and ergonomic education, and preparation in preventing injuries. Increased awareness can also lead to more resources

provided for marching band groups that prevent and treat injuries. By mapping injuries and their leading causes, scholars and directors can work to create plans that prevent them and treat them more efficiently when they occur. This is increasingly important in any physical activity because ailments can decrease quality of life and lead to future repercussions if left untreated. Teaching individuals how to best train and strengthen their bodies allows them to better adapt to their activities while increasing their quality of life and reducing the risk of future health problems.

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SPRING 2022

APPLICATIONS OF GAS CHROMATOGRAPHY-MASS SPECTROSCOPY AS AN ANALYTICAL TOOL TO DETERMINE COMPONENTS OF ELECTRONIC CIGARETTE LIQUIDS, Δ8-THC GUMMIES, AND HAND SANITIZERS

The use of electronic cigarette (e-cigarette) devices has increased over the last few years by both adults and adolescents. In 2019, a bill was signed raising the legal tobacco purchase age from 18 to 21 in all 50 states. While this was beneficial in helping prevent health risks in adolescents, these e-cigarette devices are harmful to individuals of all ages. The problem is that most users, regardless of age, are oblivious to what chemicals they are putting into their bodies and what effects those chemicals have on their health. E-cigarette liquids contain the addictive chemical nicotine along with several chemical compounds that are not on the ingredients list. The goals of the first part of the project are to determine all chemical components of various disposable e-cigarette liquids as well as the actual nicotine concentration in each liquid. Because e-cigarettes have only been used for a few years, there is not a lot of research on these devices. There is also uncertainty about the long-term effects of these devices.

The second part of the experiment aims to analyze the components of 8-THC gummies. 8-THC is a psychoactive substance found in the *Cannabis sativa* plant. While 9-THC, also found in the *Cannabis sativa* plant, has been deemed illegal in several states in the U.S., 8-THC has not been federally prohibited. The two chemicals are very similar in structure, as shown in scheme 1.
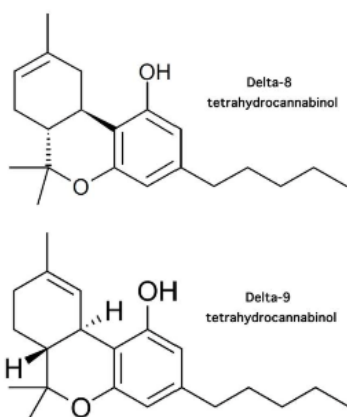
Scheme 1. *Chemical structures of 8-THC and 9-THC.*

8-THC is naturally produced by the cannabis plant; however, it is not a significant amount. Large amounts of 8-THC are manufactured from hemp-derived cannabidiol (CBD). Both 8-THC and 9-THC are known to have psychoactive effects. It has been reported that 8-THC results in less severe effects, but it also depends on the amount consumed. It is important to note that this compound is not federally approved or regulated, so these products may not be consistent in manufacturing. It is of interest to analyze this product quantitatively to determine the amount of 8-THC and 9-THC present, as well as to identify the presence of other chemicals.

One of the most widely used products for proper hand hygiene is

hand sanitizer. The CDC recommends use of alcohol-based hand sanitizers containing at least 60% alcohol. Most hand sanitizers are formulated with either ethyl alcohol (ethanol) or isopropyl alcohol (isopropanol) as the active ingredient, whose structures are shown in scheme 2. There may even be other ingredients such as aloe or vitamin E advertised in certain hand sanitizers.
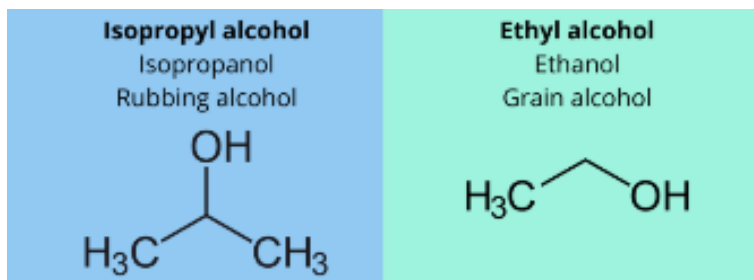
Scheme 2. *Chemical structures of isopropyl alcohol and ethyl alcohol.*

While ethanol and isopropyl alcohol have slightly different chemical structures, they have similar disinfectant and antiseptic abilities. Both types of alcohol can kill bacteria, viruses, and other germs that cause sickness.

Each of the three substances listed above will be analyzed using Gas Chromatography-Mass Spectrometry (GC-MS) to determine its components. The GC component of the GC-MS separates the chemical mixture while the MS component identifies the separated components. The GC possess a mobile gas phase and a beta-cyclodextrin capillary column that serves as a solid stationary phase. As the components are heated up and vaporized, they are carried through the column by the carrier gas. Because different compounds have different boiling points and interact with the stationary phase differently, components elute from the column at different times (known as retention times) as the GC oven ramps up the temperature at a certain rate. The separated components then enter the mass spectrometer and are identified by their molecular weight. This data is presented in the form of a chromatogram, where peaks are shown as components vaporize. A computer equipped with a library database with known mass spectra of different compounds is then used to identify the compounds.

METHODS
Analysis of E-Cigarette Liquids
The best procedure for this experiment was determined from prior literature. Each of the three e-cigarette liquids first underwent a dilution. 10 microliters of each liquid was diluted with 0.99 mL of methylene chloride to achieve a 1:100 ratio and placed in three separate GC-MS vials labeled

JUUL, BIDI, and POP. Each sample was then run on the GC-MS under the parameters shown in Table 1.

Table 1. *Analytical parameters of an Agilent GC-MS on E-cigarette liquids.*

Agilent GC Parameters	
S/SL Inlet	250 °C, split ratio 50:1
Injection Volume	1.0 L
Carrier Gas	He
Column Flow Rate	1.8 mL/min, constant flow mode
Oven	70 °C (hold for 2 min), 15 °C/min to 225 °C (hold for 4.5 min)
Column	Agilent Cyclodex B

Nicotine Calibration Curve

Pure nicotine was obtained and used to create three diluted solutions. A 4% nicotine solution was created by mixing 40 microliters of pure nicotine with 0.96 mL of ethanol. Similarly, a 6% nicotine solution and a 10% nicotine solution were created by mixing 60 microliters of pure nicotine with 0.94 mL of ethanol and mixing 100 microliters of pure nicotine with 0.90 mL of ethanol, respectively. Each of these three standard solutions was then used to make three 1:100 solutions with methylene chloride by mixing 10 microliters of each standard solution with 0.99 mL of methylene chloride. All three standards were injected into the GC-MS for analysis using the parameters in Table 1.

Analysis of 8-THC Gummies

In order to analyze the 8-THC gummies with the GC-MS, an extraction method was necessary. The gummy was placed in an Erlenmeyer flask, submerged in hot water. This flask was then placed in a sonicator for 30 minutes until no solid material was observable. The remaining liquid was placed in a separatory funnel with hexane to allow for separation of organic and aqueous layers. The aqueous layer was discarded, and the organic layer was placed in a test tube and used for further analysis. Using a 1.0 mL syringe, 0.5 mL of the remaining solution was mixed with 0.5 mL of methylene chloride and placed in a GC-MS vial. The sample was injected into the GC-MS under the parameters shown in Table 2.

Table 2. *Analytical parameters of an Agilent GC-MS on 8-THC gummies.*

Agilent GC Parameters	
S/SL Inlet	250 °C, splitless
Injection Volume	1.0 L
Carrier Gas	He
Column Flow Rate	1.8 mL/min, constant flow mode
Oven	60 °C (2 min), 5 °C/min to 230 °C (7 min)
Column	Agilent Cyclodex B

Analysis of Hand Sanitizers

Four hand sanitizers were analyzed for the third part of the experiment. The procedure was determined from a prior experiment from the FDA. The brands used included Germ-X, Purell, Suave, and Equate. Using a micropipette, 50 microliters of each hand sanitizers were mixed with 50 microliters of acetonitrile and 900 microliters of HPLC grade water and placed in separate GC-MS vials. The four samples were injected into the GC-MS under the parameters in Table 3.

Table 3. *Analytical parameters of an Agilent GC-MS on hand sanitizers.*

Agilent GC Parameters	
S/SL Inlet	250 °C, splitless
Injection Volume	1.0 L
Carrier Gas	He
Column Flow Rate	1.8 mL/min, constant flow mode
Oven	31 °C (2 min), 30 °C/min to 230 °C (4 min)
Column	Agilent Cyclodex B

Ethanol Calibration Curve

Pure 200-Proof ethanol was obtained and used to create three dilution solutions. A 60% ethanol solution was created by mixing 300 microliters of pure ethanol with 200 microliters of HPLC grade water. Similarly, a 75% ethanol solution and a 90% ethanol solution were created by mixing 375 microliters of pure ethanol with 125 microliters of HPLC grade water and mixing 450 microliters of pure ethanol with 5 microliters of HPLC grade water, respectively. Each of these three standard solutions

was then used to make three 1:1 solutions with 1-butanol by mixing 0.5 mL of each standard solution with 0.5 mL of 1-butanol. 1-butanol was used as an internal standard. All three standards were injected into the GC-MS for analysis using the parameters in Table 3.

RESULTS/DISCUSSION

The Electronic cigarette (e-cigarette) samples used were menthol flavored Juul pods (5% nicotine), a menthol flavored Bidi Stick (6% nicotine), and a cool menthol flavored Pop (5% nicotine). The Juul pod is a cartridge that is inserted into an e-cigarette device, while the Bidi Stick and Pop are disposable e-cigarette devices. These results were then compared to the advertised values on the packaging for each sample. The e-cigarettes were bought from a local gas station right outside the University of West Georgia campus, which means they were easily assessable to adolescents.

The resulting chromatograms identified several compounds found in the three e-cigarette liquids. Figure 1 shows the chromatogram for the Arctic Bidi Stick as well as the compounds identified with their retention times. The only ingredients listed on the packaging for this e-cigarette liquid were propylene glycol, menthol, glycerin, nicotine, and benzoic acid. Propylene glycol and glycerin served as solvents for the liquid; menthol served as the primary source of flavoring; and benzoic acid served as a preservative in the liquid. Other compounds identified include L-menthone, isopulegol, menthyl acetate, pulegone, tetradecane (emission product see https://par.nsf.gov/servlets/purl/10180924), and carvotanacetone. These compounds serve to provide additional menthol flavoring.

Figure 1. *Arctic Bidi Stick GC-MS chromatogram and identified peaks with retention times (in minutes).*

Peak	RT	Compound
1	2.102	Methylene Chloride
2	5.4913	Propylene Glycol
3	8.49	L-Menthone
4	8.6495	Isopulegol
5	8.9356	Menthol
6	9.124	(+/-)-Menthol
7	9.34	Menthyl acetate
8	9.4033	Pulegone
9	9.5519	Tetradecane
10	9.739	Carvotanacetone
11	10.3662	Glycerin
12	10.6193	Nicotine
13	11.115	Benzoic Acid
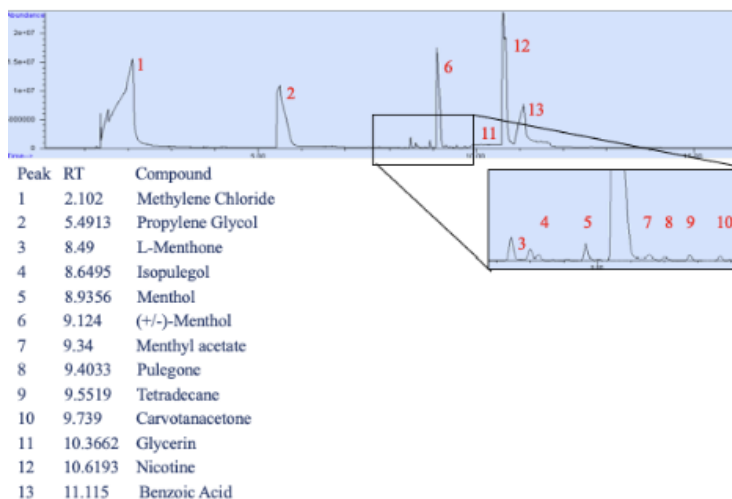
The second e-cigarette liquid, from the Cool Menthol Pop, had similar results. The resulting chromatogram and identified compounds with their retention times can be found in Figure 2. Compounds listed on the ingredients list for this device include propylene glycol, menthol, glycerin, nicotine, and benzoic acid. Other compounds identified include menthone, menthane, and carvotanacetone. Again, these compounds are flavor additives.

Figure 2. *Cool Menthol Pop GC-MS chromatogram and identified peaks with retention times (in minutes).*

Peak	RT	Compound
1	1.365	Methylene Chloride
2	5.47	Propylene Glycol
3	8.496	Menthone
4	9.129	Menthol
5	9.338	Menthene
6	9.756	Carvotanacetone
7	10.12	Glycerin
8	10.675	Nicotine
9	11.25	Benzoic Acid
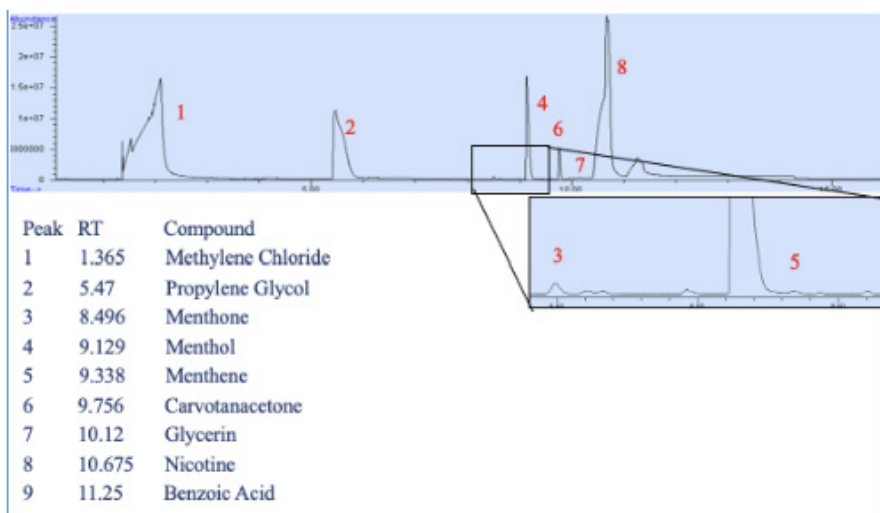
Interestingly, the Menthol Juul Pod's label correctly identified all compounds found on the GC-MS chromatogram. The chromatogram for this e-cigarette liquid along with the identified compounds and their retention times are shown in Figure 3. Because the Juul brand was widely talked about in the news, it was expected that this e-cigarette liquid would not contain any unlabeled chemicals. While these devices are not federally regulated, it did not come to a surprise that the lesser-known devices contained extra chemicals not listed in the ingredients list.

Figure 3. *Menthol Juul Pod GC-MS chromatogram and identified peaks and retention times (in minutes).*

Peak	RT	Compound
1	1.3652	Methylene Chloride
2	5.027	Propylene Glycol
3	8.6183	Menthol
4	9.561	Glycerin
5	10.0863	Nicotine
6	10.5033	Benzoic Acid
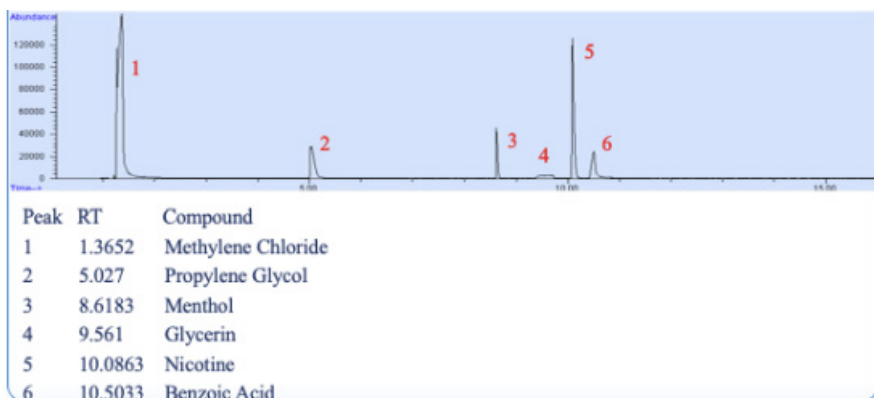
The nicotine calibration curve was created by plotting the three known stock nicotine concentrations versus the peak area ratio of nicotine to methylene chloride. The resulting graph is shown in Figure 4. Using the line of best fit, the experimental values of nicotine concentration were determined for each of the three e-cigarette liquids, and these findings are summarized in Table 4. The Bidi Stick claimed to have 6% nicotine in its liquid, however it was determined to have 6.9% nicotine. The Pop advertised a nicotine content of 5% but was found to contain 5.5% nicotine. Lastly, the Juul pod advertised a nicotine content of 5%, yet it was determined that it contained 5.4%. The Juul pod had an experimental nicotine content closest to its advertised value. Again, this may be due to the fact that the Juul brand was widely controversial in the news, so they needed to be as accurate as possible with their manufacturing.

Figure 4. *Nicotine calibration curve.*
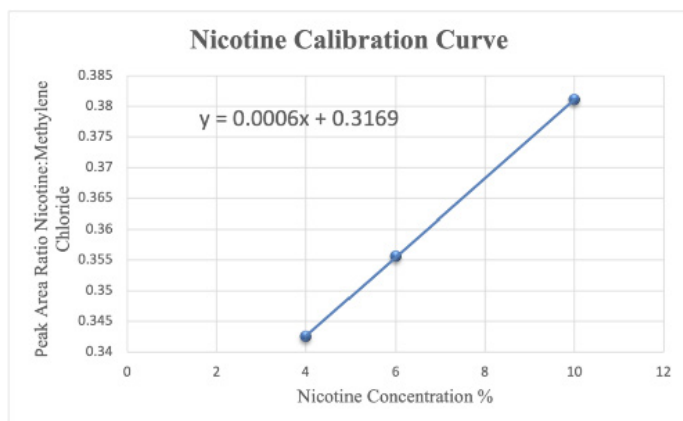
Table 4. *Labeled nicotine concentration versus actual nicotine concentration for the three e-cigarette liquids.*

E-Cigarette Liquid	Labeled Nicotine Concentration	Actual Nicotine Concentration
Bidi Stick	6%	6.9%
Pop	5%	5.5%
Juul Pod	5%	5.4%

In the next part of the project, the 8-THC gummies used in this experiment stated on the packaging that each gummy contains 25 mg of 8-THC and may contain 0.3% 9-THC. The 8-THC sample that was ran on the GC-MS provided no useful data. The chromatogram only showed a long, stretched peak for methylene chloride, the solvent which was mixed with the organic layer prior to analysis. The chromatogram is shown in figure 5.
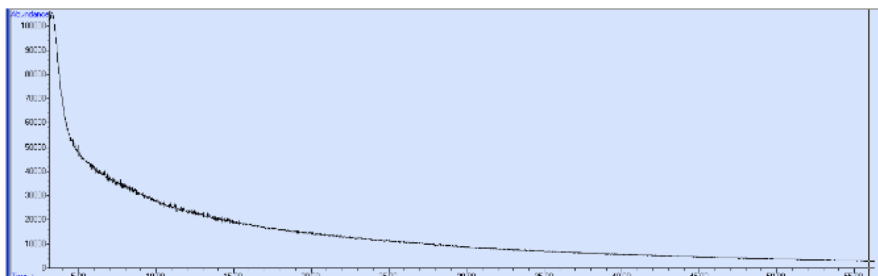
Figure 5. *8-THC gummy chromatogram.*

It was later determined that the 8-THC could not be identified on the GC-MS because of its high boiling point (175-178 °C). With the Cyclodex B column that is in the GC-MS used for this experiment, the oven cannot exceed 230 °C. 8-THC is expected to vaporize at a temperature higher temperature than most identifiable compounds for GC-MS. It was expected to see other components other than 8-THC, but they may have been in such little concentration that the methylene chloride overpowered the chromatogram. If it were possible to obtain a more highly concentrated sample of 8-THC gummies, identification and analysis of the other components of the sample may have been possible.

The four hand sanitizers being studied were Germ-X, Suave, Purell, and Equate. Germ-X and Purell advertise 62% ethyl alcohol as the active ingredient, while Suave advertises 65% ethyl alcohol, and Equate advertises 63% ethyl alcohol. The Purell hand sanitizer says it contains aloe, and the Equate hand sanitizer says it contains vitamin E. Analysis of the chromatograms of the four hand sanitizer samples also did not meet

expectations. The internal standard, 1-butanol, was the only compound identifiable by the NIST98 library, despite there being several peaks on each chromatogram. The 1-butanol vaporized around the 5.5 min mark on each chromatogram. The chromatograms in Figure 6 belong to Equate, Germ-X, Purell, and Suave, respectively.
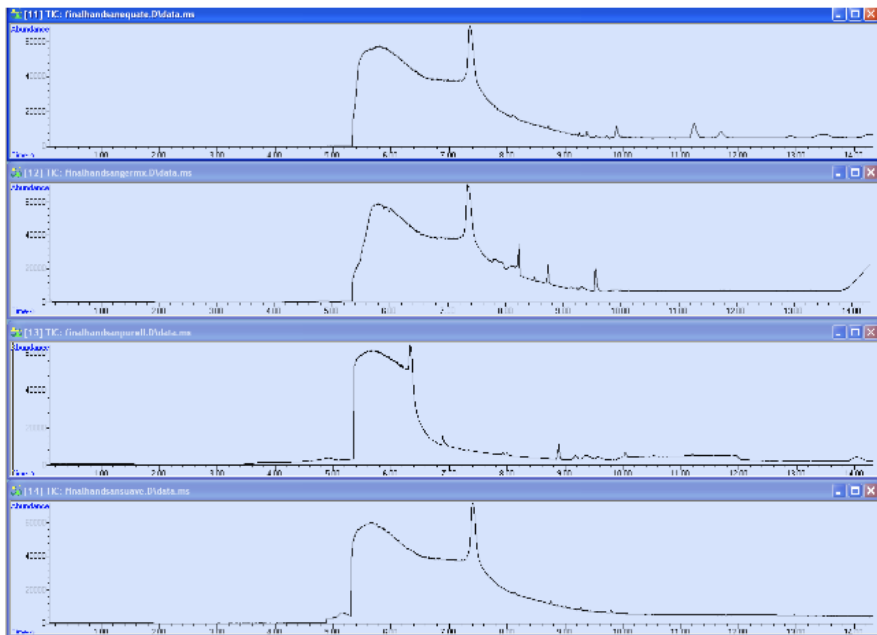
Figure 6. *Chromatograms for Equate, Germ-X, Purell, and Suave hand sanitizers, respectively.*

Ethanol was expected to show up on the chromatograms, as each hand sanitizer listed this alcohol as the active ingredient, however further experimentation showed that the GC-MS would not identify ethanol, even when not mixed with any other solvents. This problem also contributes to the problem creating an ethanol calibration curve. This curve would be used to determine the actual ethanol content in each sample, similar to that created for nicotine in the e-cigarette liquids; however, ethanol was not identifiable in any of the three diluted ethanol solutions. Figure 7 shows the chromatograms for the 60%, 75%, and 90% ethanol solutions.
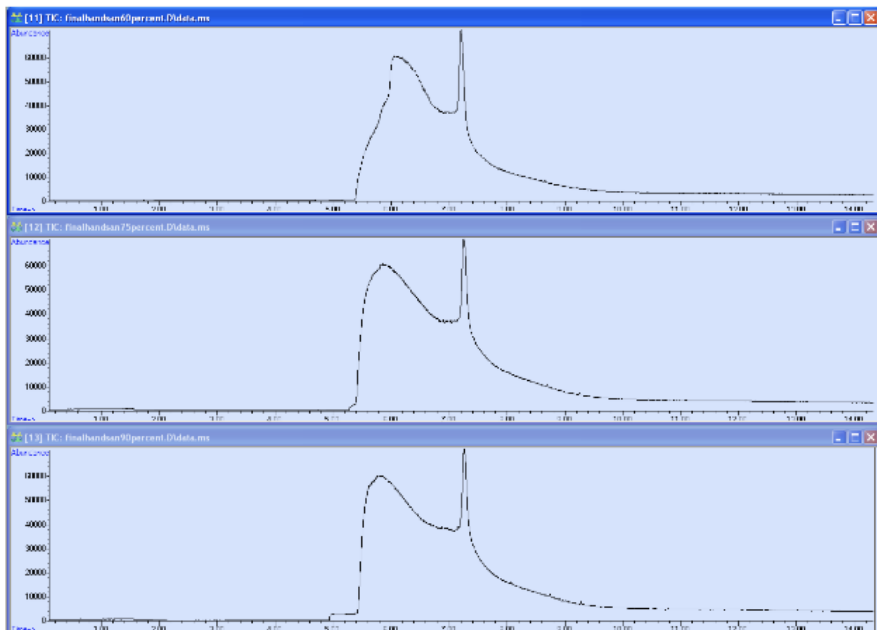
Figure 7. Chromatograms for 60%, 75%, and 90% ethanol solutions, respectively.

Similar to the four hand sanitizer chromatograms, the only identifiable peak occurred around the 5.5 min mark and was determined to be the internal standard 1-butanol. Because the GC-MS could not identify ethanol in this part of the experiment, the hand sanitizers could not be analyzed for their actual ethanol concentrations. The source of this is unknown at this time because prior researchers were able to obtain positive results.

Overall, gas chromatography-mass spectrometry is a great tool to identify components of a mixture. While there may be certain instrumentation limitations, especially with compounds that have higher boiling points, there are thousands of compounds that can be identified. The e-cigarette experiment allowed for a great, detailed analysis of the liquids with positive results. If the GC-MS used was equipped with a different column that could accommodate for higher temperatures, the range of compounds identifiable would increase.

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USING DNA BARCODING TO TRACK THE POLLINATING HABITS OF APIS *MELIFERA* AT THE UNIVERSITY OF WEST GEORGIA'S APIARY

World-wide, pollinator populations are shrinking. Several overlapping factors contribute to this disturbing global trend, including habitat fragmentation, pesticide use, climate change, and the spread of emergent pathogens, parasites, and predators. In the US, beekeepers have lost ~30% of their colonies every year since 2006, with total annual losses sometimes reaching as high as 42% (pers. Comm. Bee Informed Partnership). Population changes in other insect pollinator species, including wild bee species, flies, butterflies, and beetles have also been observed, although limited historical data is available to quantify these declines. Indeed, there are several hundred thousand species of pollinators and tracking all of them is not possible. However, surveys have documented disturbing population declines and even local extinctions of select pollinator species across Europe and the US.

Pollinators depend on their natural surroundings for food and nesting sites. Most pollinators are insects (bees, flies, moths, butterflies, beetles), but select birds and mammals also provide essential pollination services. Each pollinator species has a unique life history and specific habitat needs. Unfortunately, human activities have reduced the quantity and quality of pollinator habitat worldwide. At the same time, global warming threatens the remaining habitat.

Today, humans have altered more than half of the world's terrestrial land, with the majority of land conversion due to agricultural development. Human activities have fragmented the landscape into heavily developed tracts, wildlife preserves and everything in-between. Not surprisingly, habitat loss is strongly correlated with declines in biodiversity. The size and shape of the remaining habitat fragments, as well as how they connect to each other, affect how much wildlife they can support.

Habitat fragment size varies widely, from inner city gardens to wildflower meadows. In general, smaller fragments offer fewer floral

or nesting resources to pollinators when compared to larger fragments. The smaller pollinator populations that result are more susceptible to environmental stressors like drought or disease. These challenges can prevent some pollinator species from persisting on small fragments, especially on fragments that are poorly connected to larger habitat patches. Close or well-connected fragments create a habitat network, increasing the resources available to resident pollinators. Conversely, greater distances between fragments limits or prevents pollinators from accessing the resources in detached habitats. Species with strong flight capabilities pay an energetic toll to reach disjointed habitats. Meanwhile, weak fliers that are unable to reach distant fragments may face local extinction.

Fragment shape and neighboring land use also affect pollinator habitat quality. The unique environment present where two habitats meet can support a distinct biological community. Such "edge effects" can have positive or negative effects on pollinators. For example, the shaded edge of a field bordering a forest might promote the growth of diverse blooming plants, supporting the local pollinator community. However, the edge of a natural field bordering an agricultural plot could be contaminated by pesticides, posing exposure risks to pollinators. Edge effects can be magnified by a habitat fragment's shape. For example, long and narrow land parcels have a longer perimeter than do condensed, circular land parcels of the same area.

The negative effects of habitat loss and fragmentation are magnified by global warming. Changing weather patterns may degrade the quality of remaining habitat. Furthermore, as average temperatures rise, the habitable range for many species is predicted to shift. However, some species may have difficulty moving to new territory in a highly fragmented landscape.

The Western honeybee, *Apis Mellifera,* is an exotic species of pollinating bee that depends upon the pollen and nectar of local flora as a

source of nourishment for their colonies. Although native to Europe, Asia, and parts of the middle east, *Apis mellifera* was introduced to North America in 1622 by European colonists. The role of bees in the natural order of our world is crucial and their importance as pollinators, both for agriculture and for wild plants, can't be underestimated. Nor can it simply be quantified in monetary terms. Bees are what is known as a keystone species, ensuring the continued reproduction and survival not only of plants but other organisms that depend on those plants for survival. Once a keystone species disappears, other species begin to disappear as well.

Female honeybees spend their days foraging for pollen and nectar to bring back to the hive. As bees fly through the air, they build up a positive static-electric charge on their body. This helps them to collect the pollen dust from the flowers they visit since the negatively charged pollen will be attracted to, and stick to, the bee's body in much the same way that a balloon rubbed against a wool sweater will stick to the wall. Once the bee's body is covered with fine pollen grains, the bees will use stiff hair-like structures on her legs to groom themselves and "comb" all the pollen off their body. Some honey or nectar is regurgitated from the honey stomach and mixed with the pollen grains in order to help them stick together. Special hair-like structures which are situated on the tibia on the bee's hind legs and nicknamed the pollen baskets (corbicula) are used to pack the pollen into small pellets to be transported back to the hive where it is used primarily for feeding and raising the young. Because bees only visit one species of plant at a time, each pellet can be used to identify from which plant the pollen was collected.

Understanding the availability of pollen resources around apiaries throughout the brood-rearing season is crucial to increasing the number of colonies. However, detailed information on the floral resources used by honeybees is limited due to a scarcity of efficient methods for identifying pollen species composition. Traditionally, pollen identification was based on the morphology of the pollen grains, however identifying pollen via microscopy requires a high level of expertise in the pollen characteristics of the specific plants being studied. Even with extensive training, it can still be extremely difficult to identify pollen accurately with high taxonomic resolution.

The process of pollen identification has been greatly improved with the implementation of molecular techniques particularly barcoding methods. Pollen DNA barcoding is the process of identifying pollen donor plant species through the amplification and sequencing of specific, conserved regions of plant DNA. There have been several different regions of plant DNA that have been used as targets for genetic barcoding including rbcL, matK, trnH-psbA, ITS1, and ITS2.

The long-term goals of the UWG Pollen Barcoding Project (PBP)

are to 1) assess the biodiversity utilized by honeybees in the UWG apiary, 2) identify the most dominant plant species utilized by the bees, 3) map the seasonal patterns of for each species, 4) identify transition patterns between species, 5) identify the key plant species utilized during stressful periods (e.g. overwintering, hottest periods of the summer, drought). These results will help develop pollinator management plans at the local, state and federal levels.

The goals of this study were to 1) develop a protocol to extract genomic DNA from pollen, 2) determine the protocol for amplifying genetic markers used in pollen DNA barcoding, 3) to identify the plant species from which it originated and 4) begin analyzing the pollination patterns of honeybees over the course of a year. In order to contribute to goals 1, 3, 4, and 5 of the PBS, we analyzed the least frequently pollinated plant species by sequencing the lowest weight pollen samples collected during each sampling period for a calendar year. The pollen samples used were gathered from managed colonies at the University of West Georgia apiary.

METHODS AND MATERIALS

The pollen pellet samples collected for the purpose of this study were gathered from the Apiary at the University of West Georgia. The apiary is located west along the nature trails found behind Tyus Hall on the West Georgia campus (Figure 1).

Figure 1 A map of the University of West Georgia, Spring 2022. The location of the Apiary, Tyus Hall, and the Nature trails are all labeled.

The pollen was collected from three to five of the active hives, depending upon hive health at the time of sampling. Collection of samples

began on April 14th, 2021 and continued every two weeks until March 16th, 2022. During each sampling period a scrubber (Sundance), also known as a pollen trap, was placed on the hive entrance for 24 hours. The scrubber is a box with small holes designed to brush the pollen pellets off the bees as they enter the hive (Figure 2).

Figure 2. Scrubbing tray used to collect the pollen pellets from the hive. The entrance holes can be seen to the left of the image.

The pellets then drop down into an enclosed space where they can be collected the following day. Once collected from the hive, graduate student Daniel Gilley sorted the pellets into jars by color, recorded the weight of each jar, and placed them in a freezer until they were needed for extraction.

DNA Extraction
For this study, DNA was extracted from the lowest sample weights using the DNeasy® Blood and Tissue Kit with modified procedures. The first step in the extraction process was to select the largest pellet from each jar and transfer it to a 1.7 mL microcentrifuge tube (Genemate) and labeled the tube with the vial number. We then added 400 µL Buffer ATL using a 20-200 µL micropipetter (Fisherbrand Elite, Model QU17653), 15 ul of Proteinase K, and three glass boiling beads. The tubes were then placed on a vortexer set at the highest speed for two hours at room temperature. The tubes were then transferred to a horizontal shaker plate within an incubator (Biometra, OV5) at 62.5 ºC overnight.

The following day, the sample tubes were removed from the oven and placed in a tube rack. At this point the pollen pellets were broken up

and the pollen was suspended within the ethanol and Buffer ATL/Proteinase K mixture. Once cooled, we added 200 ul of AL buffer and the sample was vortexed for 15 seconds. We then added 200 ul of 200 proof ethanol and again vortexted the sample for 15 seconds. The liquid contents of each tube were then transferred to a DNeasy Mini spin column placed within a 2 mL collection tube. Each tube was centrifuged for 2 minutes at 8000 rpm (Eppendorf, Model 5424). The residual liquid in the 2 mL collection tube was discarded and replaced with a fresh collection tube. The next step was to add 500 µL of the Buffer AW1 to each spin column using a 100-100 µL micropipetter (Fisherbrand Elite, Model QU17703) and centrifuge them for 2 minutes at 8000 rpm. Again, the residual liquid was discarded in the waste bin and the spin columns were placed in a fresh collection tube. 500 µL of Buffer AW2 was then added to each spin column and vortexed for 4 minutes at 14,000 rpm to thoroughly dry the membrane in each collection tube. The final step of the extraction process was to place each spin column into a 1.7 mL microcentrifuge tube (Genemate), elute the DNA remaining on the membrane with 200 µL Buffer AE, and centrifuge the spin columns at 8000 rpm for 2 minutes.

DNA Amplification and Sequencing

After the extraction process was complete, we performed a polymerase chain reaction (PCR) to amplify an ~400 base pair section of the ITS 2 gene, a non-coding internally transcribed spacer located between the 5.8S and 28S rRNA of nuclear ribosomal DNA. The PCR amplification and sequencing was performed using a combination of two primers: the ITS_3_F (forward): 5'- GCA TCG ATG AAG AAC GCA -3' and the ITS_4_R (reverse): 5'-TCC TCC GCT TAT TGA TAT GC -3'. Both primers were sourced from Integrated DNA Technologies and diluted to a 10x concentration. A 0.2 mL tube (Thermo Scientific, Model AB-0620) was used to prepare the amplification reaction. Each tube contained 10 µL of GoTaq® Green Master Mix, 0.75 µL of each of the forward and reverse ITS primers diluted to a 10x concentration, 12.5 µL of purified water, and 1 µL of the DNA sampled suspended in the AE Buffer solution.

The 0.2 mL tubes (Thermo Scientific, Model AB-0620) containing the amplification reaction mixture were then placed into the thermal cycler (Applied Biosystems™ A37834). The thermal cycler was set to run a 3-stage, multi-part procedure that we developed to optimize the results of the polymerase chain reaction (Table 1).

	Process	Temperature (ºC)	Time (Seconds)	Number of Cycles
1	Initial Denaturation	95	300	1

2	A) Denaturation B) Primer Anneal- ing C) Extension	A) 95 B) 52 C) 68	A) 45 B) 30 C) 60	35
3	A) Final Exten- sion B) Hold (Until re- moved)	A) 72 B) 4	A) 305 B) ∞	1

Table 1 Configuration of the thermal cycler protocol. This table depicts the 3 stages of the thermal cycler protocol including the processes, temperatures, times, and number of cycles.

Upon completion of the amplification process gel electrophoresis was used to confirm a positive result for each sample. The gel was made by dissolving 1.5 grams of agarose powder in 100 ml of 1% Tris-Acetate-EDTA (TAE) buffer and heating the solution for 2 minutes in the microwave. The boiling solution was then poured into a mold, mixed with 4 µL of ethidium bromide (10mg/ml), and allowed to set for a minimum of 20 minutes. The gel tray was then removed from the mold, placed in the electrophoresis rig, and submerged in TAE buffer solution. The electrophoresis rig (FisherBiotech, Model FB135) was set to run on a constant voltage of 80 volts for approximately 45 minutes or until the visible band of dye had reached halfway down the tray.

The gel was then removed from the tray and placed on a UV transilluminator (UVP, Model LM-26E) set to 302nm. The illumination of a single band within the sample column confirmed a positive amplification result while samples that displayed multiple illuminated bands (Figure 3) or no bands (Figure 4) were discarded.
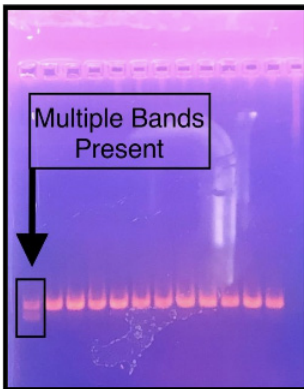
Figure 3. Depicts a double band in an agarose gel.
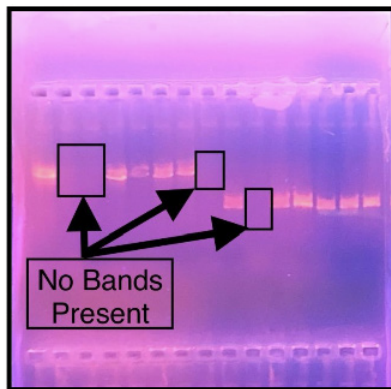
Figure 4. Depicts the absence of a positive result on an agarose gel.

Prior to DNA sequencing, it is necessary to remove excess primers, unincorporated nucleotides and denature the polymerase enzyme from positive PCR products. To accomplish this we added 4 ul of EXOSAPiT PCR Product Clean–Up Reagent to each positive PCR (USB Corporation, Cleveland, OH) consisting of a single amplicon (Figures 3 and 4.). Once cleaned, amplicons were sequenced in both directions with the original primers in 10 ml sequencing reactions with BigDyeVR Terminator v3.1 (Applied Biosystems, Foster City, CA) following the manufacturers recommendations. The samples were then analyzed on an ABI Prism 3730 sequencer (Applied Biosystems, Perkin-Elmer, San Diego, CA). Sequences were assembled, edited, and aligned using SEQUENCHER 4.7 (Gene Codes, Corp., Ann Arbor, MI)

Using the SEQUENCHER 4.7 program we aligned the sequences from the forward and reverse reactions of each sample to form a contig. Some sequences failed to assemble a cohesive contig due to poor quality or lack of overlap between the forward and reverse reactions. For these samples we utilized whichever sequence, forward or reverse, was of the highest quality in place of a contig. We then used the chromatogram function on the SEQUENCHER 4.7 program to confirm the automated analysis and edit where necessary. Ambiguities within the contigs were reported using the letter "N" where the raw data failed to yield a clear signal for a base. These ambiguous bases, especially near the sequencing primer site, were corrected to reflect the results of the chromatogram or trimmed. Some samples displayed heterozygous single-nucleotide polymorphisms (SNP) that appeared as two overlapping peaks, calling for two different bases in a single peak position (Figure 5). Any detected heterozygous peaks were defined using the IUPAC ambiguity codes (Table 2).

Symbol	Bases
W	A or T
R	A or G
S	C or G
M	A or C
K	G or T
Y	C or T
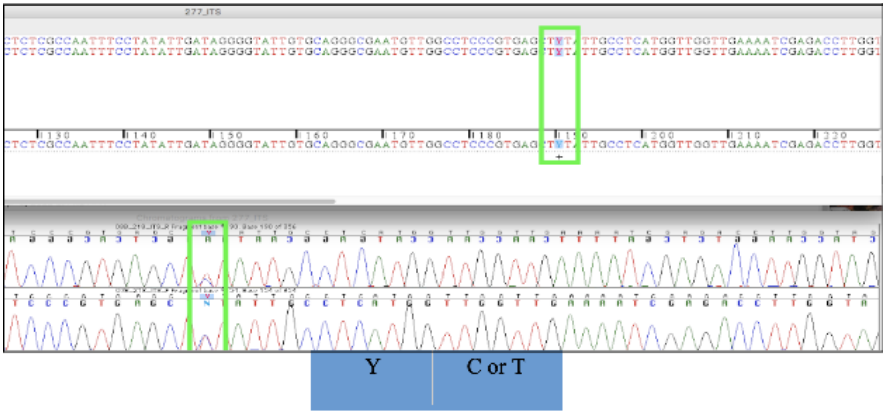
Table 2. IUPAC ambiguity codes

Figure 5. Screen capture of a contig on the SEQUENCHER 4.7 program. Example of a heterozygosity and respective IUPAC code highlighted by the green rectangle.

After assembling, editing, and aligning the sequences, we used the Basic Local Alignment Search Tool (BLAST) from the National Center for Biotechnology Information (NCBI) to match the produced nucleotide sequences to similar sequences within the GenBank/NCBI database. When a sequence is put into the BLAST tool, a list of potential identifications is produced along with a set of quality metrics for each match (Figure 6). For this study, match results were assessed using the query coverage, and percent identity metrics. The query coverage metric is the percentage of the contig length that aligned with the NCBI database match, this measures how long the sequences are relative to each other. The percent identity is a measurement of identical bases within the aligned sequences.

Figure 6. A sample of results for a BLAST search including quality metrics.

RESULTS

For the purpose of this study, 48 vials of pollen were selected. These vials contained the lowest weight samples from each bi-monthly collection period. After the extraction and amplification processes, all 48 samples displayed a single band on the gel, confirming the isolation of the ITS2 gene. These samples were then sent off to be sequenced.

The DNA barcoding regions produced by the sequencing process were used to identify 30 of the 48 pollen pellets tested to the genus and species taxonomic level. 10 of the 18 samples that we were not able to identify comprised all the pollen collected in the months of May 2021, December 2021, and January 2022 so there was no data to evaluate for these months.

For the 30 pollen samples that were successfully sequenced and identified, a calculation of percent abundance was used to analyze how often each of the identified species was collected (Figure 7). The percent abundance was calculated by dividing the frequency of each species by the number of species identified in total then multiplying this number by 100 ((# of times each species was identified/ 30) • 100).
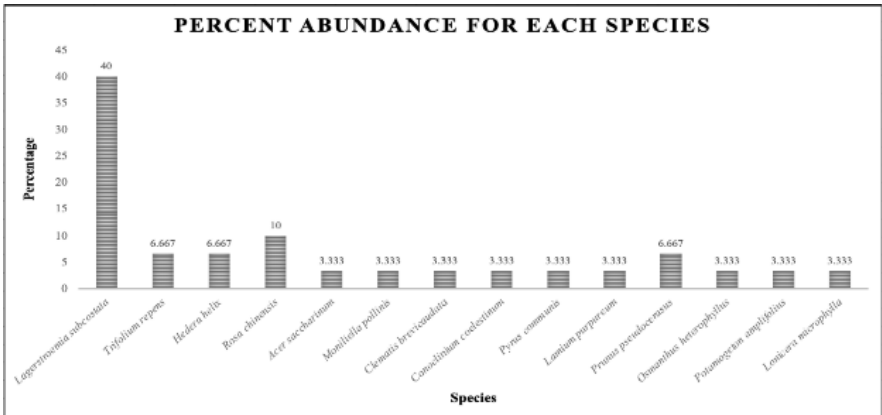
Figure 7. This graph displays the percent abundance for each species was collected and identified throughout the course of the study.

Over the 9-month period in which the 30 pollen samples were collected, pollen from the Crepe Myrtle tree, *Lagerstroemia subcostata,* was found to be the most abundant. Crepe myrtle pollen comprised 40% of all the samples sequenced. However, when comparing the samples by weight (in grams) the bees collected more pollen from Silver maple tree*s, Acer saccharinum,* in the month of February than crepe myrtle pollen throughout all 9 months.
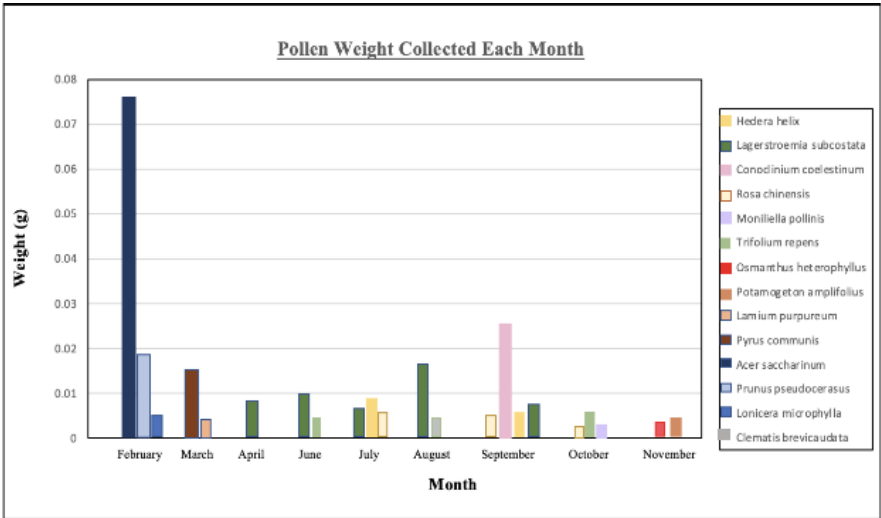
Figure 8 shows the measurement (in grams) of each pollen species by the month in which they were collected.

After identifying the origin of the pollen samples, we noticed higher levels of activity in February which raised some questions about the bloom times of the plant species identified. We found that only 20% of the 30 identified pollen samples were collected within the known bloom time of their respective species. The table below (Figure 8) shows the known bloom time of each species, indicated by the grey shaded boxes, while the red dots indicate the months in which each species was collected.
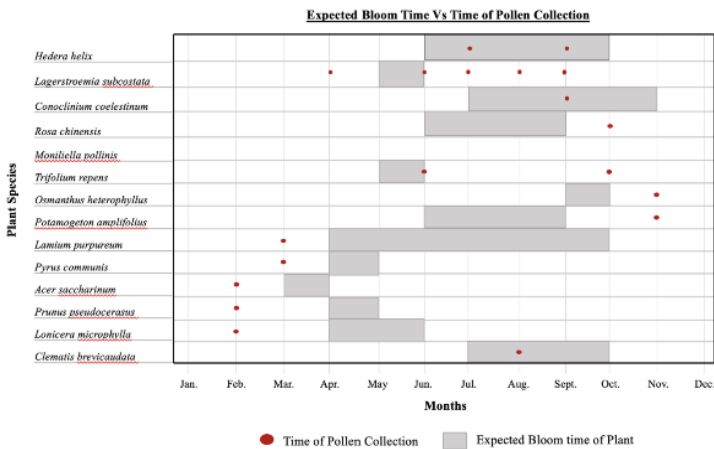
Figure 9 Pollen collection dates compared to known bloom time of each species.

DISCUSSION

The results of the DNA barcoding methods developed in this study provide new insight into the pollination patterns adopted by managed colonies of *A. mellifera* at the University of West Georgia. Using our newly developed methods, we were able to successfully identify 30 out of 48 samples to the species level. The 18 samples that were not identified underwent the same extraction, amplification, and sequencing processes but resulted in fragmented DNA segments that we were not able to combine into a cohesive contig for further analysis. This was likely result of non-specific contamination (i.e. soil fungus, mold development), cross contamination as a result of the "pollen scrubbers" or that occurred during the collection process. This cross contamination could result in the presence of pollen grains from multiple plants in the same pollen pellet.

The calculated percent abundance on its own does not hold great significance, however when combined with the total weight calculations it led to some interesting observations. When looking at the percent abundance calculations (Figure 7) it can be noted that *Lagerstroemia subcostata,* or Crepe myrtle, comprised 40% of the 30 samples that we identified. However, the crepe myrtle pollen collected in total only had combined weight of 0.0461g while *Acer saccharinum,* or Silver Maple, had a percent abundance of only 3.33% but a total combined weight of 0.076g (Figure 8). This comparison shows that while the bees pollinated the crepe myrtle trees frequently, throughout 5 of the 9 months, they were not gathering a large quantity of pollen from them. In contrast, only one sample of silver maple pollen was collected, in the month of February, yet the weight of this sample was almost double the sum of all 5 samples of Crepe Myrtle.

Additionally, figure 9 shows a comparison between the month that each sample was collected compared to the known bloom time for each identified species. We found that only 20% of the samples were collected during the bloom time of their respective species. These results suggests that either our understanding of bloom windows for these plants is inaccurate and needs to be reassessed on a local basis or that the blooming times for these plants have been substantially altered.

Many regional studies have shown that species phenology, the study of periodic events in biological life cycles and how these are influenced by seasonal and interannual variations in climate, has shifted earlier by several days to weeks. The phenological shifts are generally in step with rising temperatures attributed to global warming. These observations have been supported by experimental studies linking warming to phenological shifts, and have sparked concern over the possibility of a global warming-induced "phenological mismatch" between mutualistic partners, such as flowering plants and their pollinators. While the results show that the bees

are able to utilize these plants during these times, if our results are an early indicator of a phenological shift, these changes could lead to mismatches with other pollinators. Recent studies have shown that these phenological mismatches can have profound consequences across entire ecosystems.

Additionally, our data also showed that the bees had a strong preference for non-native plant species as only 21% of the identified species were native to this region. The three species native to this region were the *Acer saccharinum, Potamogeton amplifolius, and Conoclinium coelestinum.* The propagation of invasive species can disrupt the structure and function of ecosystems. Non-native plants can alter the community composition of natural habitats, reducing food and shelter resources available for all species of wildlife. Native pollinators have co-evolved with the plants they visit, such that their physiology is matched to most efficiently exploit the nectar and pollen resources of the flowers upon which they specialize. For pollinators that are physiologically adapted to specialize on particular plants, non-natives may present floral structures that are inaccessible to local pollinating animals, preventing them from reaching the nectar reward that lies within. In such cases, the nonnative plant "steals" the reproductive opportunity to spread its pollen by attracting pollinators that unwittingly transfer pollen grains while visiting flower after flower, seeking nectar that is physically inaccessible to them. The invasive species rob the ecosystem by propagating throughout the habitat, while returning no ecosystem benefits to the animals that depend on that habitat for survival. Pollinators visiting invasive species are drawn away from native plant species, which may result in reduced reproductive capacity and degeneration of native plant habitats. Introduced plant diseases can be carried from non-natives to native plants on the bodies of pollinators seeking food, and hybrids can be unwittingly created through the genetic mixing that occurs. Invasive plants can also directly impact pollinators, as shown in the case of the invasive species, garlic mustard (*Alliaria petiolata*). Garlic mustard threatens native plants in forests of the Eastern and Midwestern U.S. by out-competing native species in the mustard family, known as "toothworts" (Genus Cardamine). Toothworts provide the primary source of food for caterpillars of the rare West Virginia White Butterfly (*Pieris virginiensis*). Besides causing local extirpations of native toothworts, the chemicals in garlic mustard have a toxic effect on the White Butterfly's eggs, keeping them from hatching when butterflies unwittingly lay their eggs on the plant's foliage.

In conclusion, this study developed new methods for the successful extraction of whole genomic DNA from pollen pellets, determined the optimal conditions to amplify multiple species-specific genetic markers, and provided data for addressing four of the five main goals associated with the UWG Pollen Barcoding Project (PBP). Finally, our study laid the foundation

for the development of the pollinator habitat enhancement plan which is a conservation plan developed to address the improvement, restoration, enhancement, or expansion of flower-rich habitat that supports native and/or managed pollinators.

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CONSTRUCTS OF GENDER IDENTITY AND SEXUALITY IN K-POP

The Korean popular music ("K-pop") or Hallyu Wave has spread far beyond the reaches that were originally intended by South Korean entertainment companies. Because K-pop is highly "designed" and branded by entertainment companies, one cannot say that K-pop was meant to be more than a consumer product, but throughout the years, K-pop has proven to reach more people of varying demographics through more than just geographic spread and music chart statistics. K-pop artists and their associated fandoms have become a safe-haven for individuals of all ages, races, religions, and especially sexualities and genders by creating a community in which fans can grow into themselves as individuals. Although South Korea itself is a conservative country, through K-pop, many fans have been able to explore their identities with a support system that stretches across the globe. As such, I would like to use this essay to further analyze how K-pop relates to identity, specifically how K-pop idols are designed to fit certain gender roles and how said roles slip between the social boundaries of gender. I would also like to explore how K-pop artists—especially those that seem to go against heterosexual norms—and their fandoms create a safe space for identity development whether based on gender, sexuality, individuality, or community as a whole.

Before getting into the breakdown of gender identities and performances in K-pop, it is important to set a basis for how this paper understands gender. Judith Butler explains how gender is formed or represented separately from sex: "gender is…. an identity tenuously constituted in time—an identity instituted through a *stylized repetition of acts*….through the stylization of the body and… the mundane way in which bodily gestures, movements, and enactments of various kinds constitute the illusion of an abiding gendered self" (519). These performative aspects of gender closely relate to how K-pop artists create their idol personae over time

and how these personae can, occasionally, use their platforms to champion lived queer experience. K-pop, like all music, is based on performance. K-pop idols train for many years before debut and are highly influenced by their entertainment companies which makes them somewhat different from Western artists. They are, in many ways, the carefully crafted products of the companies under which they are signed. Vocal lessons, choreography lessons, and, many times, plastic surgery are some of ways in which entertainment companies attempt to mold their trainees into the ideal groups or solo artists. Often, trainees begin to take on a designated persona that the company has picked out for them, which can include a stage name entirely different from their legal name. With these personas come gender tropes which range from "softer," more effeminate males, "beastly" males, androgynous idols, hyper-femininity, or a mash-up somewhere in between. Sometimes, these tropes allow K-pop artists to slip between the normative boundaries of gender and identity.

In an interview with BuzzFeed's Evan Ghang, Amber Liu of f(x)—in response to a fan's question about fragile masculinity—states that "Masculinity and femininity are on a spectrum. You can be any part on that spectrum" ("Amber Liu" 04:05-04:10). Amber's statement reflects the K-pop industry and how many K-pop artists are portrayed despite the seeming rigidity of the roles designed for them. K-pop's, "beastly" males, for example, are aligned more with the hetero-patriarchal image that western civilization has come to demand in the male sex. Though not many K-pop artists fit snugly in this category, some close representations could be Taeyang of BigBang (who is married to Min Hyo Rin, one of South Korea's actresses), B.M. or "Big Matthew" of KARD (who is tall with large muscles but was raised in America), and Shownu of Monsta X (who is often commended for his strength on variety shows). Effeminate males, known as

"flower boys" for their softer images, are more common, like Xion of Oneus or Minhyuk of Monsta X, both of which have more delicate features and are portrayed as more in tune with their feminine sides. Truly androgynous idols are more difficult to come by, but Amber Liu fits the category the most as she sports short hair, multiple tattoos, genderless/casual clothing, and is unapologetically out-spoken in her vlogs and other media. Hyper-femininity is extremely common in girl groups such as Girls' Generation (also known as SNSD), Red Velvet, and TWICE, but they are beginning to vary from the usual "girl next door" image. By showcasing these different personas in music videos, variety shows, and live performances, idols as an ensemble cast of images are given more depth thus making it difficult to place them in a solid category.

In their music videos and other media, K-pop artists can, and often do, shift from one gender trope to another, and that shift can vary between videos, performances, and daily life. Many idols transform their outer appearance using makeup, clothing, and accessories without much thought to gender specificity. Again, using Xion as an example, he has dressed up as well-known female Disney characters for Halloween every year since joining RBW Entertainment in 2018: Snow White, Maleficent, and Cruella de Vil, respectively. He is often seen wearing chokers, light colors, and cat-like makeup; though again, it is impossible to know how much of Xion's style is influenced by the company. Even so, Xion is part of a larger group of male idols who are capable of transitioning from the handsome prince type to beast mode on stage. Wonho, formerly of Monsta X and now a solo artist under Highlight Entertainment, is another artist that disrupts the boundaries of gender. During his time with Monsta X, Wonho was very open about his clothing choices, making it known to fans and the media that he has the final say in his stage outfits. Many times, Wonho is seen wearing crop tops, lace bodysuits, and chokers while singing heavier songs. In his trainee days and in the early eras of Monsta X, one could have easily put Wonho in the flower boy category, but over the years as his love for fitness grew, Wonho's body has come to align more with the traditional Western "man," someone seen as burly and strong, a protector. To see such a "man's man" wearing traditionally feminine clothing speaks volumes about his identity and how comfortable he is while being in the spotlight.

Meanwhile, K-pop artists such as Amber Liu of f(x) deconstruct the image of what femininity "should be." Amber Liu is an androgynous Taiwanese American who debuted with f(x) under SM Entertainment in 2009. Born and raised in America, Amber is very candid about her views despite her role as a K-pop artist. In the earlier-referenced BuzzFeed interview, Amber answers a fan question about being a female idol in the Korean music industry that does not prescribe to typical gender roles and

beauty standards: "Because K-pop has now become so international, once you kind of put yourself out there, you're prone to just getting criticism…. Hopefully through what I do, I can slowly open someone else's mind..." ("Amber Liu" 04:42-05:33). Knowing how society will respond in advance can make it easier to stand against the wave of doubt, and by using the platform that she has to speak out about hate and unconventional body types/ genders/sexualities, Amber has given a voice to people of various gender roles and sexualities. On other aspects of femininity in K-pop, music videos and albums are given intentional concepts by the entertainment company and occasionally the artist, depending on the contract or specifics between them. According to Dr. S. Heijin Lee, "In early K-pop, you really have these two sorts of brands of femininity [for example 2NE1's darker concepts versus Girls' Generation's traditional "girl next door" concepts]" ("Gender Politics of Kpop" 05:48-05:55). However, with differing concepts, the female idols are still slender, which promotes the idea that one must fit into the traditional image of beauty. Hyper-femininity is slowly becoming a thing of the past for K-pop artists. As of today, not many female groups are strictly set under the hyper-feminine category, and often, they use a variety of concepts to downplay the "girl next door" tradition.

Music videos, while still a product of the company, serve as a liminal space for queer identification in K-pop. The sub context and plot of K-pop music videos promote gender identity and sexuality, including those that go against social norms. Music videos and compositions are mostly spearheaded by the entertainment company, but there are cases in which the K-pop artists are given more leeway with the production process. As such, it can be hard to determine whether the plot or visuals of a music video are backed by the companies or the artists. As with all media, the meanings behind music videos are often left up to the interpretations of the viewers. According to Oleszczuk and Waszkiewicz, "The 21st century K-pop music videos serve as symbolic and material sources of identity (Lee 2006, 136) and often approach the construction of gender and sexualities by challenging and/or going beyond concepts that are believed to be common knowledge in the spheres of sex, gender, and expressions of desire by employing specific visual encodings..." (119). By showcasing the ability to effectively slip between gender roles in music videos, K-pop artists develop positive representations of queer identity and self-love in media that affect people globally regardless of demographics. To illustrate this, I'll be analyzing XIA's "Even though I already know," MAMAMOO's "Um Oh Ah Yeh," Monsta X's "All In," and K. Will's "Please Don't."

The music video for XIA's "Even though I already know" (2012) explores the internal struggle of gender and identity through three different depictions of XIA. The first depiction that we are shown is the "middle

ground" between XIA's more feminine and masculine identities, sharing traits of both. This XIA is looking into a room from a dreary sidewalk and window with longing to see the more masculine XIA doing interpretive dance. Immediately, it seems as though XIA is conflicted between what he is and what he is being forced to be in the public eye as Masculine XIA is clearly a performer. Masculine XIA, although wearing flamboyant clothing, has sharper features and shorter hair and is the most popular based on his interactions with dancers and photographers. Masculine XIA appears to be torn between his profession and what he feels, as he never really looks at the other characters of the video and does not seem to be truly happy. Feminine XIA has longer hair and less outrageous clothing but is seen alone in a dimly lit room. Feminine XIA's loneliness is likely due to being locked away in the room alone for so long. Masculine XIA and the first XIA swap places on a throne at 02:32, and XIA appears to be in agony but also deeply involved in the visual meshing of the two bodies. However, XIA is seen with tears rolling down his face almost immediately after, and at 03:30, the two drastic versions of XIA are shown on screen as they lean toward each other in a mock kiss. This is the only time that the two drastic identities interact with each other, but the moment is short lived and Feminine XIA fades out of the scene completely, almost as if he is no longer needed while Masculine XIA lingers. Based on this performance, XIA's identity seems to have been forced upon him by his career and social expectations. In a more literal sense, some idol groups are directly portraying—or satirizing—the opposite gender in order to make a point that gender is not necessarily based on physical sex. The following performance by MAMAMOO provides a look at how someone's outward appearance gives signals of masculinity or femininity and how society often perceives gender through shallow visuals.

MAMAMOO's "Um Oh Ah Yeh" music video (2015) is highly comedic and challenges gender roles as Solar stalks Moonbyul with the idea that she is "just [Solar's] type" all while under the impression that Moonbyul is a man. At the same time, the two other members of the group are dressed up and even altered through video editing to look like men. In her attempts to stalk Moonbyul and win her heart, Solar is vigorously flirting in short skirts and low-cut shirts while trying to use her femininity to draw Moonbyul into her web. However, Moonbyul is not affected by Solar's attempts in a positive way and clearly sees Solar as a pest. Meanwhile, Hwasa's character is smitten with Solar's looks and acts sexually toward her, even going so far as to grab Solar and force her to the ground. Wheein is mostly a side character but plays the nerdy male role. In this way, the characters are all portraying gender stereotypes that are common in media: the over-sexualized and determined female, the attractive and "perfect" male, the sexualizing and determined male, and the undesirable and nerdy male. The

main plot is broken into pieces by scenes of the girls in typical k-pop fashion in random rooms (a bathroom, a nice empty room, and a salon of sorts that almost looks like a car garage). At the end of the video, Moonbyul's sister rolls into the room and asks "Sis, who's this girl?" while pointing at Solar. Solar's immediate reaction is to scream and fling pillows as if it were her room that Moonbyul and her sister had intruded. Although their depictions are quite outrageous, having a popular girl group cross-dress for the sake of a music video helps to open the channels to speak about gender and sexuality. MAMAMOO's video shows that gender identity and sexuality are valid, though only if the participating parties agree. Other groups like Monsta X also use their platform to shed light on toxic heteropatriarchy and homophobia though through more subtle means.

Monsta X's "All In" (2016) music video seems to depict a homosexual relationship between group members Minhyuk (white hair) and Hyungwon (black hair) as the members of Monsta X (or the "X Clan") attempt to work against military and religious corruption by committing their own crimes. After the group mocks the police for picking on a couple of merchants, they are shown hanging out in a small alleyway when a group of older religious men appear—this can be deducted based on the crosses shown on the books that they carry. One of the men strikes Hyungwon, and Minhyuk is the most disturbed by the scene. The men were not present when the X Clan mocked the police, so it is unlikely that Hyungwon was hit because of his involvement; if anything, this strike seems personal, and Minhyuk's disturbance and presence in the next scene seems more involved than just that of a good friend. In the next cut, Minhyuk and Hyungwon are in a mostly empty room aside from scattered books and pages, but Hyungwon's face is being covered by a white ski mask only to be revealed by Minhyuk that he has been severely beaten, likely for betraying the religious hierarchy that the older man stands for. Hyungwon's dejection when Minhyuk storms off makes the viewer question whether Minhyuk will return to Hyungwon's side. Minhyuk does not know how to contain his rage for Hyungwon's predicament in that moment and jumps to violence quickly, but Hyungwon's sadness in this moment reads as misunderstanding Minhyuk's quick exit for not wanting to be a part of the relationship (platonic or otherwise) any longer. It is not until the three-minute mark that Minhyuk returns to Hyungwon's side in the "present" to find that Hyungwon has attempted suicide. Minhyuk is visibly unsure of how to proceed but eventually gets in the tub with Hyungwon's body. Not many people would get so intimate with a dead body, laying with a body in the tub and holding its hand. Although all of this is speculation, as Starship Entertainment has not explicitly explained "The Clan" Era plotline, it is clear that Minhyuk and Hyungwon are very close in the music video, close enough that many fans including myself believe the two to be in a

homosexual relationship for the purpose of the performance. Showing such a deep relationship regardless of the intended sexuality of the members in the video opens the topic in an otherwise close-minded area.

K. Will's "Please Don't" (2012) plays on audience expectation of a heterosexual man's jealousy over a heterosexual relationship but offers a twist showing that the music video is about a man being in love with his male best friend. In the video, an unnamed man (further referred to as "Man 1") serves as the audience's main perspective and is often seen disgruntled while in the presence of an unnamed young woman. Most of the scenes flash between Man 1 and the female in a car and different instances of the two interacting—the first being the woman wearing a veil. At this point, the audience is already being set up with the idea that Man 1 is in love with the woman. While she seems very playful and cheerful with Man 1, he clearly struggles to get along with the woman and is only held back by his best friend's (further referred to as "Man 2") presence. The music video focuses on Man 1's aggravation with the happy couple, and Man 1's blatant glares at the two further the suspicion that he longs to be in their shoes—but which of the two would he rather be? He seems very surprised by their engagement, but he still puts on a smile for the bride on her wedding day. However, at 02:40, the scene shows Man 1 reaching to touch the woman's face while juxtaposing the act with the couple's vows before the woman disappears from the car. As her wedding ring is placed on her body, she disappears from the passenger's seat which could only mean that she is no longer legally or emotionally available. It is not until the last ten seconds starting at 03:37 that Man 1 rips a photo of the three down the woman's body and puts himself and Man 2 together and that Man 2 is seen in the car. The pairing seems unexpected at first glance, jarring even, but the signs were there all along—expectation of the social norm is what makes the scene impactful. Compared to the "All In" music video, notably also developed by Starship Entertainment, "Please don't" has more leeway in terms of its message. Here, K.Will's message is that expectation and judgment should not be deciding factors in sexuality or gender or how people perceive and treat those of any difference.

Oleszczuk and Waszkiewicz offer the idea that "Kpop music videos prove to be spaces of liminality that allow for the transgression of social boundaries of gender and sexuality" (129). Through these performances, viewers are able to see how gender, sexuality, and actions relate and work together to create individual meaning based on the person and the space that they have been given to experiment or expand upon themselves. The performances, whether live or recorded, create meaning for the fans and community by creating a venue (in person or in the comments section) to gather and share experiences.

Although LGBTQ+ lifestyles are becoming more accepted and supported, some countries, such as the Republic of Korea, still consider queerness to be taboo. K-pop artists and idols are opening the pathways of conversation through their performances. During their career, Monsta X members have been openly seen with the pride flag at concerts (Minhyuk more often than others), speaking about loving everyone despite their race, gender, sexuality, etc. (Joohoney's closing statement for the WE ARE HERE 2019 Tour in Los Angeles, CA on August 10, 2019), and speaking about how to deal with family members who are not supportive of non-normative relationships (Wonho and Joohoney on VLIVE on June 11, 2019), thus offering a safe space for anyone willing to listen and take part in the LGBTQ+ movement for equality. Other artists such as Amber and Holland, one of South Korea's first openly gay idols, share their experiences with hate and how they have come to love themselves despite the conservative market in South Korea. In a vlog with Rolling Stone India, Holland answers fan questions and speaks about his struggles as a self-made artist. When asked about anti-LGBTQ+ comment, he states "I don't believe in other's anonymous judgment" ("Holland" 02:00-02:35). He also gives advice to a fan who has recently come out as transgender and gay and shows his support for his fans. According to Shin Haeng Lee, et al., "online communicative practices around fandom discourse encourage rich experiences of social connectedness and common identities" (437). Despite language barriers, K-pop has become popular all over the world and promotes queer and gender equality through performances and fandom interaction. By communicating with fans, both online and offline, K-pop artists such as Monsta X, Holland, Amber, and many others showcase that connecting with others opens channels of acceptance and strength for queerness and non-normative gender identity.

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ECOPSYCHOLOGY AS AN AFFIRMATIVE THERAPY PRACTICE

Growing up, I always felt a certain special connection to the natural world around me. It was a constant safe place for me to turn to, where I felt accepted and supported. Even when the social world around me felt uncertain or unpredictable, I was able to recognize and feel nature's presence. As I grew older, nature remained a comfort and a safe place for me, and as I came into my own and explored my own identity, this was even more important. I came to understand that my family looked slightly different from other people's family, growing up in a same-sex parent household and also realising that I was a part of the LGBTQ+ community myself. This of course, brought its own difficulties and encounters with homophobia and discrimination. However, the natural world was always there and never made me feel wrong or like I or my family was "unnatural". I also happened to be in therapy for most of my young life, leading me to find a passion in the juncture of both of these topics. I found it crucial that therapists be attuned to what I was experiencing as well as to cope and process that best fit me, as a client. These experiences, as well as accounts from others, led me to explore the connections between eco-psychology and affirmative therapy. In this paper I have found explicit and meaningful connections within and between both therapies and explore how when both ideologies are used in conjunction and woven together, they can make a beautifully rich therapeutic experience. We will first explore just how necessary individualized therapy is, especially in the context of minority groups and the LGBTQIA+ community. By looking at the impact it makes on clients, we are able to see positive and effective ways in which affirmative therapy can be practiced. Nextly, we continue the journey observing the ways in which humans are in unity with the earth and the natural world, as well as the benefits of increased nature-relatedness within humans. This allows us to see how similar we are to the

inner workings of the flora and fauna of our earth and how eco-therapies can be thoroughly healing. We tie the two therapy ideologies together by looking at the similarities of how non-normative genders and sexualities and nature and the Earth, itself, are treated in our Western society, by delving into what it means to be "The Other". Through these topics, as well as addressing some other intricacies, we can see that the ideas and beliefs at the core of eco-psychology are inherently affirming to LGBTQIA+ identities. They reject the idea of human/nature difference and domination or 'othering' of nature just as much as the 'othering' or supposed superiority of heterosexual and cisgender alignment over differing sexual and gender identities. This project explores the connections between ecopsychology and LGBTQ+ affirmative therapy and the importance they hold when working together to encourage and nurture the clients' healing. This is essential to both individual client's therapy and healing experiences as well as being extremely meaningful within a larger social context. Noticing and recognizing human-nature and how we treat those who are different from the 'norm' is the first step in combating and changing our hatred.

  This story of natural and inclusive therapeutic healing will be told through a method of autoethnography. Autoethnography is a style of writing and qualitative research that allows the author's own experiences and unique life to guide the narrative and exploration of a topic in relation to social and cultural contexts. Autoethnography weaves together individual meaning-making with the larger systems of the world around us. It is especially pertinent to these topics because therapy and socio-political issues are so interwoven with the personal.

As Carolyn Ellis in the Handbook of Autoethnography explains…

> Autoethnography is not simply a way of knowing about the world; it has become a way of being in the world, one that requires living consciously, emotionally, reflexively. It asks that we not only examine our lives but also consider how and why we think, act, and feel as we do. Autoethnography requires that we observe ourselves observing, that we interrogate what we think and believe, and that we challenge our own assumptions, asking over and over if we have penetrated as many layers of our own defenses, fears, and insecurities as our project requires. It asks that we rethink and revise our lives, making conscious decisions about who and how we want to be. And in the process, it seeks a story that is hopeful, where authors ultimately write themselves as survivors of the story they are living. (Jones, 2013, p. 10)

This is especially meaningful when we are working with difficult experiences and situations that require vulnerability. This project requires me, as an author, to go back and dig deeply into my own experiences, piecing together themes and situations that make up who I am. I am creating this project because of my own experiences and what I have noticed is meaningful and important to me, individually, as well as what I have observed in those close to me. This is the best and most deeply compelling method of going about this research. Autoethnography lets the reader connect and empathize with the writing, by making what could easily be a disconnected and impersonal review of the ways humans are connected to nature and the importance of inclusive therapies, instead a vibrantly personal and meaningful dive into healing. This method of writing nurtures and encourages relational connection and empathy with the author.

Throughout the history of psychology, the idea that there is one universal truth, one universal way that we all work and experience the world has persisted. This works out just fine for those who are in the majority or those who are deemed the "norm". However, those who do not fit in this group are not represented and therefore are not only not helped by these services, but are pushed and molded further into what are seen as the societal norms. The American Mental Wellness Association notes that recently there has been a call for specialized therapies, therapies and psychologies that acknowledge the differences between race, gender, sexuality, culture, religion and other differences in existence (American Mental Wellness Association, 2019). The history of abusive practice within psychology, psychiatry and psychotherapy, now thankfully lessening in occurance, has resulted in a very

uneasy relationship between these professions and those of us identifying as lesbian, gay, bisexual, transgender or queer (LGBTQ+). The early years of human sexual research in particular were noted by the brutality of aversion therapies in which clinicians aimed to "cure" LGBTQ+ people of their "disease". Much of this activity was spurred by ideas from psychoanalysis, in particular Freudian and post-Freudian thinking about 'correct' sexual development. Later theories about behaviorism in psychology, and how we might seek to condition particular responses in people, as we do when training a dog, further fuelled this cruel and ultimately ineffective industry. In more modern times however, we are slowly coming to the realization that specializing therapy to the individual in the context of LGBTQ+ affirmative therapy is essential for a healthy, safe, and productive therapeutic experience. Because LGBTQ+ folk tend to pursue psychological and therapeutic guidance at a higher rate than their non-LGBTQ+ counterparts (Maurel, Good Therapy, 2016), it's crucial that mental health help be geared to the needs of specific groups, making the LGBTQ+ community feel safe to open up and accept support. However, this is not the case in many, many places of psychological and medical care. Because of this, one of the greatest things that can hold a person back from getting therapy is the fear of and experience of discrimination based on sexual orientation. Clients often find themselves misunderstood by the therapist and feeling like they must then educate the therapist on diverse sexual and gender identities (Maurel, Good Therapy, 2016). Differing sexual and gender identities are still often stigmatized and pathologized within the field as well - biases that have been left over from when the DSM historically classified homosexuality as a mental illness. To remedy this, an LGBTQ+ affirmative approach to therapy has been popularized within the humanistic and existential philosophies. This is an approach to therapy that embraces a positive view of Lesbian, Gay, Bisexual, Transgender, and Queer identites and relationships and aknowledges the negative effects that homophobia, transphobia and heterosexism have on the lives of LGBTQ+ clients. The AAMFT Queer Affirmative Caucus suggests that affirmative therapists should self reflect on their own upbringing, attitudes and beliefs surrounding sexuality and gender, aknowledging biases coming from living in a heteronormative and gender-binaristic society (North Dakota State University). Being involved as a therapist and living an affirmative life becoming familiar with the issues affecting LGBTQ+ clients also opens one's mind to become more understanding of client's experiences in the world. Creating an affirming setting by providing LGBTQ+ reading material and resources as well as including affirming language on paperwork (ie. using the client's chosen name and pronouns) and using gender neutral terms when referring to a client's significant other are also necessities within this approach.

Within Nigel Harrison's analysis of literature surrounding Gay Affirmative therapy he found:

> A range of methods used for improving self-esteem and developing assertiveness in clients was identified. The importance of self-disclosure and role modeling by counselors was stressed, and the relevance of teaching and use of bibliotherapy was extensively cited in the literature. The use of the core conditions and recognition of spiritual/philosophical needs was also identified. A conflict-resolution model was developed, and ways in which therapists could be more politically active and act as client advocates were listed. (Harrison, 2000, p. 49).

These therapies involving positive recognition of the diversity of human sexual and gender experience, with therapists actively 'affirming' these identities and practices as valid is extremely important and necessary in our journey to a more accepting world that embraces many different existences. This being said, it makes sense that there is no one universal psychological or therapeutic methodology that encompasses the lush spectrum of human diversity. Specialization within therapy is essential to maintaining a world where most every type of person's needs are met. Making sure that LGBTQ+ clients feel validated in their existence is extremely important in the therapy room. Practicing LGBTQ+ affirmative therapy allows for those who belong to sexual and gender minority groups to work through their traumas and heal, just as any other person would, but with the therapist's knowledge and understanding that oppressive and discriminatory societal norms surrounding sexual orientation and gender identity may be some of the roots of client's issues and that this does take an enormous toll on clients within this community.

As a person who identifies as part of the LGBTQ+ community, as well as someone who has been in therapy, I can speak on a very personal level as to why this specialization is so crucial and important. There is a certain feeling that is quite present when, as a client, I can tell that my clinician is not supportive of my identity and community. I also want to make it very clear that I when I am speaking of clinicians who do not take an affirmative approach to therapy, I'm not only talking about those who are explicitly homophobic, I am also referring to those who do not go out of their way to research and read up on queer theory and LGBTQ+ issues. Even if a clinician is open to learning and wants to support their clients, if they do not take the task into their own hands, and make the journey of acceptance their own, it is not functionally affirmative. To practice affirmative therapy,

the clinician must already be somewhat tuned into LGBTQ+ issues and have some idea of the queer experience. This creates a strong working alliance and allows the therapy session to flow naturally without the client being expected to teach the therapist the ins and outs of gender and sexuality. This expectation that the client should or will teach the therapist is placing the therapist's needs above the clients. From experience, this feels insincere and halts any and all emotional work or healing process, to explain and teach the intricacies of our social systems and the politics of the LGBTQ+ community. I know that when I step into even an intake session and the clinician asks about my "mother and father" as opposed to my "guardians" or just the "parental roles in my life" and I have to correct them, saying that I have two mothers, it doesn't feel the most welcoming or accepting. I can tell that their idea of what is "normal" doesn't include my family or who I'm romantically involved with. From there I feel wary and unsure if I will get anywhere in my healing journey with this particular therapist or at the very least- it will hinder my trust and take longer for me to feel completely comfortable enough to open up. It has been such a difficult journey of feeling like I must teach my therapists the ins and outs of all queer identity and then never truly getting down to the deep hard-hitting topics. Additionally, while taking the queer experience into account is crucial, I have also experienced the therapist then seemingly making every issue stem from me not being accepted, or every issue in my life being rooted in trauma from coming out or just being queer in the world. While it is essential to take all of these experiences into account and know that every issue is intersectional, not every trauma or issue comes down to identity. Each client is different and cannot be looked at through a cut and dry category. LGBTQ+ clients will not all have the same issues, some may be accepted by their families and have no trauma or issues surrounding identity, while others may have this as the majority of their story and what they wish to work on.

As I furthered my own emotional growth, I began to go back to my comfort in nature to find peace and healing, and began to wonder if there was perhaps a way to incorporate therapy that affirmed who I was and acknowledged and recognized my connection to nature. Looking into fields of psychology and therapies that are holistic and acknowledge all parts of the individual, the field of Ecopsychology has garnered much attention from psychologists and biologists alike with the exploration into what the human-nature connection means within our ever-warming current climate. Going back to nature and connecting with what sustains us is a growing movement and has begun to impact many fields, especially psychology and sociology. Within this context, questions posed consist of: Are humans physiologically connected to the natural world? And if so, what effect does it have on the mind and one's mental state? And even further, how

can we measure this effect? In their article "Resting State Posterior Alpha Power Changes with Prolonged Exposure in a Natural Environment", R.J. Hopman et al find that there were significant positive neurological changes during time spent in forests, near rivers, and generally in the natural world. Through intense and highly monitored sessions, participants were hooked up to an electroencephalography (EEG) machine that monitors brain waves and electrical charges from the brain's cells. It was concluded that spending focused time in nature may alter neural signatures that also relate to the ease of focusing one's thoughts on introspection and increasing awareness of the external environment. Additionally, It was found that the natural environment had to be a significant distance away from more developed areas in order to induce these more serene and deeper electroencephalography (EEG) waves. (Hopman et al., 2020) This furthers the idea that humans are much more connected to nature than we are aware of, and also furthers the belief in nature therapy being very beneficial for many, if not all clients.

Another topic within Ecopsychology that allows us to connect to nature is the mycelium- root connection. We now have scientific evidence that trees and plants are able to communicate and have meaningful connections with one another. Through these communications they pass along wisdom and knowledge from older trees to younger trees about how to collect nutrients and how to heal from and avoid diseases, how to distribute nutrients to make sure that each organism gets what they need. We now have proof that all plant matter are all connected and are able to support each other as well as other forest life. (Simard, 2016) Variety and diversity are the key to natural survival and thriving- humans can and should emulate plant life in this way. It is crucial and necessary to examine how colonization and how the western World has impacted our agricultural processes as well and if they are really what is best for humans, nature, and the planet.

In further research done more recently by Suzanne Simard, it is found that plant life, as well as trees, are increasingly understood to have "cognitive capacity for perceiving, processing, and communicating with other plants, organisms, and the environment and to remember and use this information to learn, adjust their behaviors, and adapt accordingly"(Simard, 2018) This means that we are understanding more and more that plants have their own agency that facilitates decisions and actions, aspects of intelligence that are only attributed to humans and only sometimes animals. Now knowing that plants have the capacity and ability to perceive, communicate, remember, and learn, could change how humans interact with trees and understand them to be capable of empathizing and caring for them and the environment. A crucial part of the tree and plant communication system are the mycorrhizal fungal networks. Previously we have learned that networks of underground fungi help facilitate nutrient transfer and moisture transfer between plant

roots, we are just now finding out that these fungal networks are also necessary for enhanced adaptive behaviors of plants such as perception, agency and action, as well as forms of cognition and intelligence. We see this network performing actions that we had previously only reserved for animals and humans. This root and mycorrhizal fungal network very similarly mirrors the functions of neurons in a brain. The presence of plant cell-cross walls, plasmodesmata, and synapses at the root apex- are analogous to neural synapses. Plants and trees use this neuronal physiology to then understand and sense the specifics and needs in their environment through multiple sensory organs.(Simard, 2018) This is a huge finding and can impact how we think about our world and how humans are meant to interact with one another and with the ecosystems around us. This impacts how we, as humans, think about and perceive nature. We are more alike than we can possibly know, because we have discovered the extent to which our environment communicates and operates so similarly to how we, as humans function. This realization and understanding is relevant to ecopsychology and eco-based therapies through the idea that if humans are able to truly connect with nature, our engagement with the natural world encourages and nurtures healing.

　　　Nature is so much more evolved and akin to humans than we know, this idea that humans are superior to other flora and fauna is simply false, we just don't understand the full inner workings yet. Plants and animals have far more complex relationships and experiences than we know, understanding this can help bring us together in protecting our planet and environment. Being immersed in nature and spending more time seeing these connections firsthand can show us that we are not so different from other life forms and beings on this Earth. Going deeper within the pedagogy of Ecopsychology, in John Davis and Jenine Canty's article "Ecopsychology and Transpersonal Psychology", we find what is at the very core of the field. This entails critically examining and analyzing global societies, especially those considered to be "developed" and in the Western world, looking at the somewhat recent disconnection from Nature and idea that humans rightfully have domination over Nature, as well as other cultures and societies who live more closely aligned with nature. This critical observation allows for a grounding fundamental worldview switch of awareness, more accurately re-awareness, to the "inherent bonds with the natural world including those aspects of self-identity, body, emotion, and soul that are silenced within a mechanistic worldview and renewed by direct and immediate contact with nature" (Davis et al., 2013) . This new awakening can help uncover the disconnection with nature and a deeper psyche and allow for reintegration into healthy and harmonious relationships with nature, that includes other humans, ecopsychology can (re) blaze a path of the individual

to the "larger Self of the world". Ecopsychology is not just a theoretical or philosophical topic, Ecopsychological practices also center on the human-nature connection and expanding awareness by utilizing nature as a projective device and mirroring. Ecotherapy integrates the natural world into psychological healing from trauma, grief, anger, and coping with mental illness by engaging with nature as a therapeutic and developmental resource to nurture deeper bonds to one's self and the world around them. While being immersed in nature and just generally increasing nature-relatedness can have a deeply positive effect on an individual, the practice of psychotherapy combined with eco-therapies have been shown to be extremely healing and can bring out emotions and experiences that either alone might not have been able to access. A traumatic event can shake even the most stable human to their core. It has been observed that even just an image of trees, much less being exposed to a real, living forest or flowing body of water, lowers blood pressure and calms the body and heart rate. Pertinent specifically to trauma therapy, Lefkowitz et al. (2005) proposed an animal-assisted-therapy (AAT) model for survivors of sexual abuse suffering from post-traumatic stress, thinking that it would have a greater impact to clients in a decreased amount of therapy sessions. Aside from approaching the psychological benefits of natural settings, literature concerning ecopsychology also addresses trauma from developmental and evolutionary perspectives, which suggest that nature plays a critical role (Milton & Corbett, 2011). Eco-therapy also includes gardening and horticultural therapy, animal-assisted therapy, place-bonding practices, wilderness therapy and outdoor counseling, and nature-based mindfulness work are all included under this term.

New research has been done to look at the more introspective side of eco-therapy- Eco-Spiritual Helping (ESH) is a multidimensional harmony of ways to face and understand life's challenges and to integrate processes of growth and change cultivated and nourished in healthy interaction with nature that are closely aligned with postmodern therapy. An array of ideas, approaches, and practices are represented within Postmodern therapy that allows us to deconstruct the received knowledge that our modern world provides and to imagine alternatives. It focuses on healing the ecological alienation of individuals and societies from their ancient moorings and encourages connection to their natural place on earth. This disconnect has a decidedly negative impact on healthy functioning of all individuals and communities. (Besthorn et. al, 2010) ESH focuses on the complete "mind/body/spirit/community relationship matrix" of living instead of narrowing the focus to problems associated with internal individual pathology.

Now, while the connection between affirmative therapies and eco-psychology may appear to be a bit murky at first, consider Robert Greenway's thoughts surrounding the ecopsychological project:

I work towards an ecopsychology that will find within language an accurate articulation of the human-nature relationship.This will of course be based on experience, but will be couched in language, and perhaps deepened by ritual and art. It must take up the deepest meanings of relationships in general and relationships between "mind" and "nature" in particular. It will be based on a variety of "modes of knowing" (neither ignoring nor privileging science). It must not be within the constraints of a particular psychology nor within a specific natural history discipline, but will be "integral" in that it will draw insight from all past and current attempts to depict "nature" from the human perspective (Greenway, 2009: 50)

The editorial Queering Ecopsychology explains that building on the experiences and perspectives of social movements, queer autonomy, indigenous lands, community, celebration, and organisation, adds to the rich story that encompasses and tells of those who are considered to be "Other" in the binary perception that the West has between human and nature, heterosexual and homosexual, man and woman, and that these dualities are considered to be inherent and the only natural way to exist. We see the idea within ecopsychology that critiques how we, as a Western society, view and perceive nature. We see ourselves separate from nature and even further, as above, or having domination over nature. This understanding is not thinking in terms of what is best for our environment, nor is this understanding sustainable. The divide between human and nonhuman is human constructed and essentially artificial. Even the boundaries between what is "life" and what is "nonlife" are blurry and completely fabricated. This idea sets up man-made and non-existant boundaries of what is "natural" and therefore "normal", and what, in turn, is not "natural" and "normal".(Heckert et al., 2012) Eco-psychology aims to extinguish the idea of nature as 'other', it intends to heal the way we have alienated ourselves from the natural world that surrounds us and that we rely on. This dispute as to what is normal and what is natural has long been present in queer theory and is also a concern with in psychology and, in turn, affirmative therapies, as it questions how accurate human subjectivity really is, as long as it centers on and is related to the idea of the "separate other" of nature. (Young, 2012) Because what we now understand about the importance of affirmative therapies, and just how crucial it is for acceptance and healing within our society, we can recognize that these attitudes towards the 'other' are mirrored within eco-psychology and related therapeutic practices. Within Eco-psychology and therapies, what humans have deemed as 'natural' is questioned, as well as the idea that

humans are separate from nature. If we embrace the idea that nature is not the 'other' and that nature is healing because we, as humans, are part of nature, then this would also mean that those who do not subscribe to the socially acceptable norms of gender and sexuality are not the 'other' either. The ideas and beliefs at the core of eco-psychology are inherently affirming to LGBTQIA+ identities. They reject the idea of human/nature difference and domination or 'othering' of nature just as much as the 'othering' or supposed superiority of heterosexual and cisgender alignment over differing sexual and gender identities. Eco-psychology actively demonstrates qualities of affirmative therapy, and can therefore be argued to be an affirming therapy practice and discipline in itself.

I find myself personally resonating with the ideas of ecopsychology and absolutely feel changes within myself when I spend time in the natural world. I feel more connected to the Earth and to all of humanity, as wild as that sounds. When I spend time in nature, I don't have to worry about societal conventions or norms and this allows for greater movement into healing. I'm able to accept myself and others as they are, without judgment. I know that in my own journey to healing, when I journal out in nature, or just speak out my worries to the trees, and even yelling my frustrations into the forest- I feel heard. When I plant flowers or garden, I'm able to feel the soil in my hands and know that it brings nutrients to the roots and feeds the flowers. I feel the sun on my skin and know that it, too, nourishes the very plants I am embedding into the Earth. This way of being grounds me and I feel supported and feel a bit better about my purpose on this Earth, in this lifetime. This is crucial for my own healing journey. When I came across the term 'queer ecology', referring to a perspective which views nature, biology, and sexuality through the lens of queer theory, in my own research, I found it very reassuring and felt connected to it. However, I am not a biologist, no matter how much I connect to nature, and felt that this idea could be brought into therapeutic and healing spaces. A therapeutic approach that objects to heterosexist ideas of nature, drawing from ecofeminism, environmental justice, and queer theory can help clients break apart the dualisms that appear within the human understanding of nature and culture. As was highlighted before, both ecopsychology and affirmative therapy/queer theory agree that many often regard nature in terms of dualistic notions. These can include examples like "natural and unnatural", "sentient or non sentient", "human or not human". However, in actuality nature exists in a continuous and fluid state, this is the same way both queer theory and affirmative therapy view gender and sexuality, in a continuous state. What we view as "natural" comes from our own perceptions and beliefs as humans, not from "nature" itself. The same can be said for much of what is pathologized in modern psychology. (Davis, 1998) The intersection of affirmative therapy and ecopsychology puts aside

ideas of human exceptionalism and anthropocentrism that perpetuate the belief that human beings are more advanced and therefore more important than other non-human life forms, and that there is no "right" or "natural" way to identify or love to be a valuable being or human, there is no way that is superior or more important.

To more deeply understand the need for a queer affirming ecopsychology and therapies, we must first examine a common idea or attitude in our society. The separation between "them and us" is what many issues both socio-politically and environmentally stem from. This idea is so wildly far-reaching and is so ingrained that we seem to not be able to stop ourselves from creating this split in perspective. " We seem to insist on Othering" (Staszak, 2008) at every possibility. Understanding what this process is and how and why it works is essential in healing and repairing this view. Othering is the process in which we deliberately pick at differences between "us and them" and then assign specific qualities and traits to those we feel are "us" and other qualities, beliefs, values, and traits onto those we deem to be the Other. Another commonality is that we usually reduce the Other to a "thing"; we objectify and dehumanize the Other an astounding amount. As to why we do this, psychotherapist Martin Milton suggests taking a more reductionist stance- like how we might look at the way epidemiologists figure out and assess how much of a vaccine a country needs, by surveying the rates of infectious disease and calculating it from there. This way of going about things definitely reduces issues down to the separate and specific, but is not necessarily destructive or an issue.(Milton, 2013) However, there are situations in which this way of understanding the world can be the foundation of exploitation. As we know, it is exponentially easier to exploit and abuse once we have disconnected it from the common humanity we all share (Smith, 2012). It is clear that politics, colonization, the creation and protection of nation states, sexism, racism, homophobia, transphobia, xenophobia, antisemitism and so many other economic and political and social issues struggle with this phenomena.

As we have spoken about before, we know that this ideology has bled into how we perceive and what we think of our relationship to the natural world. We know that we have increasingly distanced ourselves from water and plantlife, from the glaciers and from other animals. When we have this idea and belief in conjunction with the anthropocentric attitudes we share, it is almost sure that it will result in self-seeking and exploitative use of what we have available to us. In general, but especially in the westernized and industrialized world, as humans, we don't let much get in the way of our plans and beliefs, and we have the ability and the power to use up and redirect any resources that the earth or other beings might need. We can see that our subconscious thought process about our actions is a sort of ambivalence

about the consequences, it's a thought process that is an excuse to just barrel ahead with original plans, because plants and animals and the natural world "aren't aware, they don't feel, they aren't really alive". Many times, we don't even refer to the planet, animals, and plants as 'them'- we call them 'it', even furthering ourselves from the natural world. When humans suddenly decide that there is a need or a want for something, we have created a view of the planet that is the ultimate Other. (Milton, 2013) Our view is mainly focused on the 'in the moment', short-term decisions, rather than and seemingly not caring about the long term consequences.

We can notice the same attitudes and beliefs are present in how we treat sexual orientation and gender identities. When we notice perceived differences that we cannot control, and assign value judgements and certain traits to those that we have separated ourselves from, anger and frustration can bubble up. We see the same dehumanizing language used towards the planet and animals, as we do to those that align with non-normative sexualities and genders. We see "it" and "those people '' and "their issues' ' being used many times to describe the LGBTQIA+ community, making it easier to dehumanize and objectify and therefore exploit and abuse and mistreat. Noticing and observing the commonalities in the ways in which we treat and mistreat these two communities and concepts, allows us to weave a richer understanding of why they work together so well and why the healing process can fit hand in hand with nature and affirmative therapy practices.

Looking deeper within Ecopsychology, one cannot help but question that the need for labels or the identity of LGBTQIA+ might be incongruent to what ecopsychology advocates. In short, yes- this is true, especially of the micro labeling that is much more prevalent in recent times. Labeling and even having this 'other' identity of LGBTQIA+ does not reflect the oneness and the unity, and the questioning of 'what is natural' that ecopsychology recognizes. Theoretically this is correct, however, because of the marginalization LGBTQIA+ folk have faced, in reality, in today's society, there is a place and there is a significant value to labeling identities- it allows for pride and acceptance in one's own perceived 'difference', as well as normalizing and validating one's own feelings and experiences.(Goodrich, 2016) Even though this trend of labeling conflicts with ecopsychology's philosophy, it is recognized within queer theory that this form of labeling and essentially 'self-othering' is a step towards relinquishing the need for labels at all. While it seems contradictory, at this point in our Western society, embracing labels of differing identities will eventually lead us away from the need for labels at all. Queer theory is very much on the same page as ecopsychology in the hope for a society in which labels are not necessary. In an ideal situation, there will be no 'normal' sense of sexuality or gender, whatever is, will be.

There is a certain privilege that comes with the ability to identify with a label, however, because in the history of the queer community, only recently have we been able to claim our identity safely (somewhat) and proudly. This new phenomenon of pride is not going unnoticed or unappreciated, because of the gay liberation and LGBTQIA+ rights movement that fought for our protection, we are now able to utilize labels that give a sense of agency and freedom. We see however, that this form of labeling can work as both an act of resistance and can also be a somewhat repressive form of categorizing, as the eco psychological beliefs point out. (Wagaman, 2016) This act of declaring who you are unapologetically can be incredibly healing and is an integral step in radical self acceptance. In the micro and macro scale of the individual and the community, 'coming out' and claiming one's gender or sexual identity is an enormous weight off one's chest and is an essential step in normalizing the identity. Having to hide and having to suppress a part of who you are is excruciating, and because of these dichotomies between "man" and "woman", "straight" and "gay", "us" and "them", that exist of our own creation in our world today, the only way towards equality, equity, and acceptance is through first acknowledging that these identities exist and secondarily, by re-humanizing these identities. The only way to rehumanize the identity is for those around us to be able to identify and label themselves as such, and if we are able to recognize the humanity in our loved ones first before even knowing that they identify as LGBTQIA+, then when they do come out and make their identities clear, we will be able to integrate those two concepts of humanity and the label of queer. This is important on a larger social scale as well as in an individual and introspective sense. In these ways, the ability to label and to use signifiers is extremely important in the journey to acceptance and getting to a place in the community and in society where signifiers and labels are no longer necessary and we can all just exist as one, accepting individual persuasions as just another unique part of the individual, in a eco-psychological sense.

To bring the conversation back to the personal, it's clear the benefit of integrating the ideas of LGBTQIA+ affirmative therapy and Eco- therapy, in my experience it has been a deeply healing journey for me and for so many others I've heard from. This connection between nature and humans truly encompasses all. Because of this, the systems that are so prevalent in our society and that work their way into most every experience, we are essentially freed from when connecting with the natural world. This alleviates the pain and suffering that members of non-normative sexualites or genders experience in everyday life, for just a moment. The dichotomies and binaries that exist and crawl into most every crevice of Western society do not have such a hold on us, we are allowed to breathe freely and process our experiences, beginning to heal and access a deeper part of ourselves.

We can recognize that humans are so much more connected to nature than we truly know and knowing that nature's inner workings mirror our own, we can begin to understand that fundamentally there is no "Other", there is no way of being that isn't "right" or "natural". The understanding and the realization that we are nature, ourselves, and therefore cannot be "unnatural" is a comforting one, it supports those who identify with non-normative sexualities and genders understand that nothing is wrong with them and that there is a place for them on this Earth, that they are exactly where they need to be. The intersection of affirmative therapy and ecopsychology puts aside ideas of human exceptionalism and anthropocentrism that perpetuate the belief that human beings are more advanced and therefore more important than other non-human life forms, that there is no "right" or "natural" way to identify or love to be a valuable being or human. With all this being said it only makes sense to me that this intersection of both affirmative therapy and ecopsychology would bring healing and enhance the therapeutic experience.

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HOW HAS USING I.T. TO WORK FROM HOME AFFECTED EMPLOYEES' PRODUCTIVITY DURING THE PANDEMIC?

The beginning of the COVID-19 pandemic was a scary moment for people in the U.S. People began stockpiling unnecessary amounts of products they thought they would need to survive. Suddenly, most of the U.S workforce was sent home to wait out the pandemic. "The share of the labor force working from home increased from around 5% to over 40% in the U.S. during the lockdown (Bloom, 2020)". After a while, companies realized that this pandemic was not going to go away and that they needed to begin adapting. I saw this unfold before me in my home when my mom was sent home and told to set up an office of sorts to keep being productive. My mother, an interface engineer, requires technology to perform her work.

At first, we only saw the benefits of working from home, staying home with family, relaxing at home all day, and the savings of not having to drive to and from work every day. Then, my mother and many other Americans began to see the negative effects of not working at the office. Issues like fatigue from not having a work/home separation, communication issues with coworkers/management, or distractions from family or other things in the household. Each of these started to affect how productive employees were when working from home. Specifically, for my mother, IT seemed to be an issue. She did not seem to have any problem staying home all day or any issue with losing productivity because of distractions; however, the internet speeds in our area were terrible, and she was having trouble doing work and communicating with coworkers.

In recent years, technology has developed exponentially and continues to build way beyond our imaginations. Specifically, with fields of work that use IT, we have developed faster internet speeds which means the faster upload and download times for workers. We have collaborative technologies that allow us to work together without being in the same space. However, the U.S's IT infrastructure is lacking in some places where the rest

BY AARON GANN

of the world is not, affecting productivity.

All this spurred the question, how has using IT to work from home affected employees' productivity during the pandemic? First, to understand if any factors have any effect on productivity, we must define what productivity is. While we would most commonly see productivity as a ratio of products per measurement of time, we cannot use this measure in this instance. Instead, we need to define productivity as how many hours an employee worked every workday; specifically, how many hours they spend focused on working. This definition is beneficial because work hours became very flexible during the pandemic. People began to work longer because of the lack of work/home life separation, and people had more distractions at home that could have been taking their focus away from their work.

This paper will begin with an extensive review of recent literature concerning productivity and IT. The literature review will explain why we worked from home and why we were not working at home before the pandemic. We will then look at articles that will provide detailed examples of how IT could affect workers' productivity, followed by metrics of what employers have to say about productivity during the pandemic. Next, after the literature review, I will explain how I conducted my survey of the workforce and why it is significant to my question. I will also explain the details and design of the survey and show any potential limitations that could undermine the results. Then, I will give a thorough analysis of the results of my survey and explain why those results are significant. Finally, I will draw conclusions from the data to provide readers with an answer to my research question so that they may be able to reference my answer to draw their own conclusions on working from home during the pandemic.

LITERATURE REVIEW

What happened the last time workers were sent home to work? This is not the first time employers have sent their workers a way to work from home. There are potential benefits to having a virtual workforce, such as cutting overhead costs like office space and utilities. So, a few companies decided to experiment with a virtual workforce to gain an advantage over other competitors potentially.

In particular, we will look at IBM and Yahoo. In the early 1980s, IBM began to experiment with this idea. By 1983, around 2,000 IBM employees were working from home, and by 2009, IBM reported that about 40% of their 386,000 employees were working remotely. This change led to IBM reportedly cutting approximately $2 billion in costs. That sounds good, but why did other companies not follow this model? In March of 2017, IBM announced that it was bringing all its employees back to the offices. It was a desperate move of a company whose revenues had fallen 20 quarters in a row. "'If what they're looking to do is reduce productivity, lose talent, and increase cost, maybe they're on to something," says Kate Lister, the president of Global Workplace Analytics, which measures (and champions) working from home"' (Useem, Jerry (2017). "When Working From Home Doesn't Work"). How could this be that IBM actually lost productivity? What the workers lost was collaborative efficiency, which is a productivity measure of the ability of a group to efficiently and effectively communicate to solve problems without wasting time and resources. "Why? The short answer is that collaboration requires communication. And the communications technology offering the fastest, cheapest, and the highest bandwidth connection is—for the moment, anyway—still the office".

Yahoo went through similar issues in 2013. The main problem that Yahoo ran into was the tradeoff between productivity and innovation. "Studies show that people who work at home are significantly more productive but less innovative, said John Sullivan, a professor of management at San Francisco State University who runs a human resource advisory firm" (Miller, Claire. Rampbell, Catherine. "Yahoo Orders Home Workers Back To The Office").

The cause of this loss of innovation can be attributed to collaboration inefficiency. If employees cannot communicate effectively and in a timely manner, innovation can be hampered. For example, internet speeds can make it hard for employees to connect virtually to talk about ideas for a project. The same source gives examples of how companies have learned about this issue and are finding ways to balance the tradeoff between productivity and innovation. Most companies send workers whose jobs do not require much innovation home while retaining those who do. These examples show us why our workforce was not already primarily remote and how employees' productivity can decrease if they cannot effectively communicate. However,

both of the examples are at least five years old, and as we know, technology is developing exponentially. Where are we now in terms of working from home?

Currently, the at-home workforce is plagued by the same issues. Internet speeds in the U.S have not changed much over the years. However, the recent pandemic has forced companies to send employees home anyways. Companies that had never intended for most of their workers to work remotely were forced to allow their workers to work from home to keep their businesses alive while also slowing the spread of COVID-19. But that did not change the internet speeds in the U.S. The infrastructures in most states were not ready to handle such a large amount of workers on the internet. Slow internet speeds have affected employees in suburban and predominantly rural areas. This issue is primarily thanks to U.S Internet Service Providers (ISPs) and the FCC (Federal Communications Commission). ISPs have failed to roll out fast internet infrastructures to rural and most suburban areas, and the FCC has been unable to recognize this.

Employees have become fed up with their internet service providers because it has begun to affect their ability to work and surf the internet. A recently new resident of a rural town in Maine, Kathi Shorey, says, "Never did I think the digital divide would be so unfair" when asked about how "her chosen home would make it impossible for her to work remotely and stay connected during a global pandemic" (Tibken, Shara. "Millions of Americans Can't Get Broadband Because of the FCC's Faulty Map. There's a Fix"). Having country-wide internet access issues is bad for business, especially now. As of 2021, the U.S was not ranked in the top ten countries in terms of fastest broadband internet speeds, behind countries like Denmark and Singapore.

For a country as developed and technologically advanced as the U.S, it is almost inconceivable to see this. It is nearly impossible to keep an entirely remote workforce productive when the internet speeds in a country are very slow or simply unusable. Kathi Shorey says, "I run around my house and shut off the two phones we have, and my iPad and my home computer … so that I can get a connection". However, recently, U.S states have scrambled to provide the necessary infrastructure to withstand the workload of all these employees. In 2021, most U.S states began work to increase their internet speeds. They began passing legislation to send more resources toward building better infrastructure. According to whistleout.com, only one state has not increased its internet speeds during the pandemic, which was West Virginia. U.S internet speeds have increased 40.1% from 2020 to 2021 (Long, Moe. "Here's How (and Why) Internet Speeds Have Changed During COVID-19."), signaling a commitment to help roll out faster internet speeds to support employees of businesses.

While internet speeds have certainly changed since the IBM and Yahoo work from home cases, the technology that employees use has also changed dramatically. Computer technology is always getting better and always making itself obsolete. Computers now are much more capable than computers 20, 10, and possibly even 5fiveyears ago. Similarly, the development of new applications used to improve communication and productivity has begun to emerge over recent years because of computers' improved capabilities.

Collaboration applications, such as Zoom, Google Meets, and Mural, began to roll out as soon as IBM and Yahoo began calling back their employees. These applications have been instrumental in keeping employees connected and productive during the pandemic. In the thick of the pandemic, Zoom launched its new product, "Zoom for Home," which "allows anyone to deploy a dedicated personal collaboration device for video meetings, phone calls, and interactive whiteboarding. This category combines Zoom software enhancements with compatible hardware to upgrade the home office experience" (Smith, Jeff. "Zoom For Home is Here to Empower Remote Workers"). This product was designed to keep employees working and productive during a very stressful time in the world.

Additionally, Zoom reported that annual meeting minutes rose from 101 billion in January of 2020 to 2.6 trillion in April of 2020; they also reported revenues of $188 million in January of 2020 jumped to $328 million in April of 2020. Along with Zoom, Mural, another collaborative technology, was another application heavily used during the pandemic. Mural is a digital canvas that allows teams to collaborate visually to solve problems. To give readers an idea of how effective Mural could have been during the pandemic, in 2018, Mural released data on a study of how effective Mural's application was for IBM. Mural states, "In addition to avoiding travel costs, IBM did not require basic supplies such as sticky notes, poster boards, and catered meals that would normally be part of a multiday, face-to-face workshop" ("Total Economic Impact of Mural").

Mural reported cost savings of $16 million for IBM. Meghan McGrath, an IBM lead at the time, said, "'It was hard to get a whole team together, and it usually wouldn't include everyone because of schedules. Some voices are stronger than others in the room… Using MURAL, the team took a more structured approach during sessions. People 'speak up' more because working online makes everyone equal, nullifies dominant voices, and as a result, we have more ideas put forward… Overall, I believe we accomplish much more design thinking work using MURAL". Because of the availability of these and many other communication tools, companies could keep their employees productive without making them work in-pein person during the pandemic.

While technology has undoubtedly directly affected employees' productivity, there have also been indirect and unintended consequences of employees needing to use technology to work from home. After the high of getting to stay home to work during the pandemic, the adverse effects began to show. One of these effects, specific to technology, was "zoom fatigue." As this Stanford article describes, this was a term to describe the "psychological consequences of spending hours per day on these platforms" (Ramachandran, Vagnish. "Stanford researchers identify four causes for 'Zoom fatigue' and their simple fixes"). This article cites four causes for "zoom fatigue": excessive amounts of close-up eye contact, seeing yourself during video chats, reduction of mobility, and high cognitive load.

Firstly, humans are not used to intense close-up eye contact with other people, which "our brains interpret as an intense situation that will lead to mating or conflict." This causes our minds to constantly be hyper-aroused, leading to fatigue and tiredness that would not usually happen if employees were in person. Secondly, seeing yourself on a screen every day for work is "stressful. And there's lots of research showing that there are negative emotional consequences to seeing yourself in a mirror." Seeing yourself for work all day is distracting and potentially damaging to an employee's mental image of themselves. Thirdly, employees lose mobility they used to have when having in-person meetings or audio conversations. Employees are stuck in one spot, which is unnatural for humans. Lastly, employees have to work harder to interpret signals from other employees. This is especially true for employees in the U.S because the U.S is a low-context culture which means we communicate with explicit and defined words where words and signals need to be interpreted.

Employees spend hours getting agitated trying to interpret their employees' conversations and emails which wastes more time that they could be being productive. Each of these potential causes of "zoom fatigue" is causing employees to lose productivity and is potentially causing mental damage to employees. Another effect of using technology to work from home is the loss of a work/home life boundary. Instead of decompressing when getting off from work, employees have let their work bleed over into their decompressing time, which is essential for a healthy life. "Cardiff researchers examined survey responses from more than 15,000 British workers. Those who worked from home were more likely to go beyond a normal workday, to put in and put in more effort than they were also more likely to have difficulty switching out of work mode and unwinding" (Carroll, Linda. "How to work from home and not burn out"). This overworking has led to fatigue and a loss in productivity among workers. "Zoom fatigue" and work/home boundary issues have forced companies to acknowledge them and find solutions to them because their employees were losing productivity.

RESEARCH

Method of Research and Potential Limitations

      To try and understand if technology had any impact on workers at all, I conducted surveys, including different fields of work, to get their thoughts and opinions on if IT had any effect on them during the pandemic. The survey was completely anonymous and completed online only, which helped record data from outside and inside the area surrounding me. Most of the responses were garnered through LinkedIn, my mother's coworkers (IT company), and friends and family. The survey was created because it would be able to provide a broader scope of information from different perspectives, such as male/female, the field of work, or age. Creating this survey helped me look at answers from various areas of work, which is very important to my research question because productivity can be measured differently in each field. Given my definition of productivity, readers should be able to interpret the data with the definition of productivity in mind. The survey was also created because it would be simple, quick, and efficient so that I could get fast and mostly accurate results for questions concerning the research question.

      The questions on the survey can be split into two groups: demographic questions and significant questions specific to my topic. The demographic questions mainly were to gauge what groups of people were impacted or not impacted the most or least. This would help us understand what percentage of impact using IT during the pandemic had on certain groups. We looked at areas such as where people lived (rural, urban, or suburban), the age group they belonged to, their gender, and the number of years they have been in the workforce. These demographic questions were used to help us identify the groups of people we had surveyed and what similarities or differences may lie between them that are significant to my research question.

      The specific and essential questions were used to gather people's opinions and thoughts on how they may or may not have been affected by having to change their IT infrastructure during the pandemic. From the recent literature review about working from home and productivity during the pandemic, we can see different influences on employees' productivity and well-being. The questions I asked were meant to understand from the employees' perspectives if technology impacted their productivity while they were kept at home. Also, for those industries that rarely had to use technology in their line of work, these questions would show me if the pandemic or the technology change affected their productivity, which I believe is important for giving my results a broad scope. Specifically, the results of these questions should show us how participants thought of the effectiveness of their technology and whether or not they felt a change in productivity when moving to work from home as a result of the change in

technology.

One of the problems we may encounter with my survey was something I wanted to be there. To broaden my question's scope and show the changes in productivity across all work fields, I asked participants to tell us what field of work they were in. This would provide me with data from all fields and show me what non/low-technology using fields such as construction, welding, and others would answer. Their responses would provide control to the other responses to gauge the impact of technology when changing from working at the office to working from home. However, their answers could have skewed the data to some questions towards no/small technology usage. So, keep that in mind as you look through the results of my research.

Another problem we may encounter with data is the sample size. For this survey, I sampled around 146 (146 finished the survey but about 148 answered questions) employees from different backgrounds. Of this sample, 61% said they required technology to work. While this is still a good sample size, it could be skewed towards people in a particular work field or people in a specific region. For example, since the survey was distributed through only a few distribution channels, the survey responses could mainly comprise my mother's coworkers, family, friends, or people on LinkedIn. This would narrow the scope of my project and leave me with a sample that does not reflect the population. However, I do not think this will be an issue with my survey, but it is something to keep in mind as you view the results.

Data and Analysis of Results

First, we must examine the demographics of the survey respondents to understand the scope of the responses. The first question asked in the survey is "What industry do you currently work in." As shown below in the table, only four fields listed were not represented by a respondent. Those were Water Supply and Sewerage, Motor Vehicle/Motorcycle Maintenance, Mining and Quarrying, Agriculture, Forestry, and Fishing. So that lets us know that the responses were from a wide range of different fields, which is suitable for understanding technology's effect on productivity during the pandemic across all fields of work. The field with the most responses was Professional and Technical; these are people with jobs in IT and other high usage IT fields which is perfect for helping us examine the questions of this survey. The fields that garnered the most responses were predominantly fields that used IT the most.

(Industries the respondents worked in)

Top 5	Answer	%	Count
	Wholesale and Retail Trade	3.42%	5
	Water Supply and Sewerage	0.00%	0
	Transportation and storage	2.05%	3
	Real estate activities	3.42%	5
	Public administration and defense	2.05%	3
1	Professional and technical	18.49%	27
	Accommodation and food service	0.68%	1
	Motor vehicle/motorcycle maintenance	0.00%	0
	Mining and Quarrying	0.00%	0
	Manufacturing	5.48%	8
4	Information and communication	12.33%	18
2	Human health and social work	15.07%	22
5	Higher Education	10.96%	16
	Financial and insurance	4.11%	6
	Electricity and Gas	0.68%	1
	Construction	2.05%	3
	Construction	0.68%	1
	Arts, entertainment, and recreation	1.37%	2
	Agriculture, Forestry, and Fishing	0.00%	0
	Administrative and support services	4.11%	6
3	Other service activities	13.01%	19
	Total	100%	146

Our following few questions look at the gender, age, and geographical location of the respondents. More than half of the respondents

were female, which I do not think will have much significance on the questions in the survey, but still necessary to understand who is answering. The age of the respondents was generally between 30 and 59; most of which was around 40-49 years old. The age of the respondents may play a role in their dissatisfaction with technology and how affected, they think they were by the pandemic, as we know that older people have a more challenging time adjusting to change. Most of the respondents resided in either rural or suburban areas, with 10.27% of respondents living in urban areas. This could impact how respondents rate their internet speed, as we know the U.S has been slow to roll out network infrastructure to less urban areas.

Lastly, of these demographics, we look at respondents' time in the workforce. This is so we can know if they were employed or unemployed during the pandemic. So we can gauge the experience level of the employees, so we can understand how adaptable they are to changing working conditions. Of the respondents, 75.17% have spent more than 15 years in the workforce. Of that portion, 37.93% have spent 30-40 years in the workforce. 24.84% of the respondents have been in the workforce for less than 15 years. During the pandemic, 96.58% of the respondents were employed, while 3.42% were not employed or lost their jobs due to the pandemic. To follow the demographics, we will look at five charts that look at the specific questions in the survey.

The first chart specific to my research is a cross-tabulation between "How would you rate your internet speed?" and "In which area do you live? (Urban, suburban, or rural)". We found from this chart that only 13.3% of urban respondents said their internet speeds were adequate, and none were below that category. Compared to rural respondents, of which 19.7% said their internet was non-existent or barely usable. This quantifies the "digital divide" between these areas. We also see that suburban respondents did not rate their speeds as highly as urban respondents. These are completely expected and reflect internet speeds well during the pandemic.

	Total	Urban area	Rural area	Suburban area
There is no internet	1.4%	0.0%	3.0%	0.0%
Barely usable	7.6%	0.0%	16.7%	0.0%
Adequate	35.2%	13.3%	43.9%	31.3%
Very good	30.3%	60.0%	22.7%	31.3%
Very fast speed	25.5%	26.7%	13.6%	37.5%

The following chart that we will look at is the answer to the question, "How did the pandemic affect your work-life?". As a preface, the chart shows the number of responses, but I will present them as response numbers and percentages. The chart below shows that 66 respondents said that the pandemic significantly impacted their work-life. Along with drastic effects, that category accounts for 64% of the respondents. This shows us that most of the respondents believe that their work-life was altered in some way, and it changed how they work.
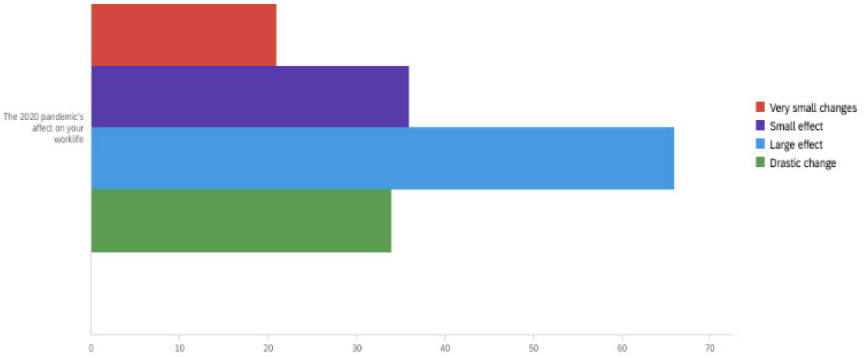
In the third chart, we look at the question, "What do you think we factors in the change to your work-life?". This question is multiple choice. As we can see, the top five answers in order were: Family, Home Environment, Mental Health, Internet Speed, and Child Care. This chart gives us insight into what factors were the most influential to each respondent because they could choose more than one. We also note that Inadequate Technology is the least selected answer.
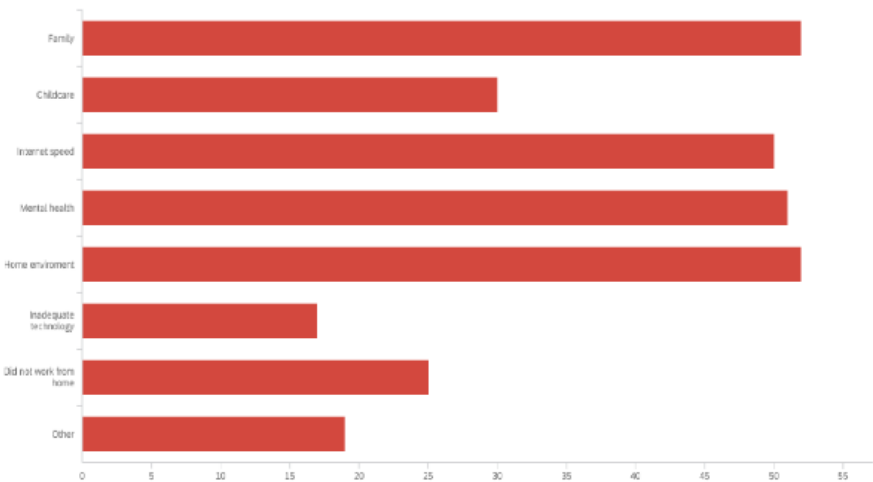
In the fourth chart, we look at the question, "How has changing to work from home affected your productivity?". As we can see in the chart below, the category with the most responses was Not At All, which accounted for 27.66% of the respondents. The rest (72.34%) of respondents said there was at least a negligible effect on their productivity. However, I would have expected more of the respondents would have said that there was a more significant impact on their productivity, especially after most respondents said the pandemic had a substantial effect on their work-life. We can conclude from this situation that the impact that collaborative technologies like Zoom and Mural had on the workforce was instrumental in keeping the workforce productive and, therefore, caused the respondents not to have noticed a decrease in productivity when working from home. Those collaborative technologies were effectively a bridge across the pandemic to keep industries afloat.
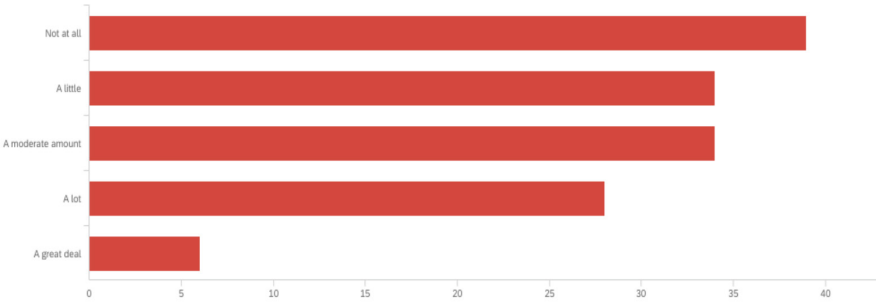
In the final chart, we will examine the question, "After the change from in-person to working from home, would you prefer to work from home or go back to in-person?". In the chart below, we can see that most of the respondents (82%) said they would like to either work from home entirely or be able to do it both at home and in person. This chart helps us understand that most people were satisfied enough with their at-home working conditions (family, technology, childcare, etc.) that they would like to keep working at home.
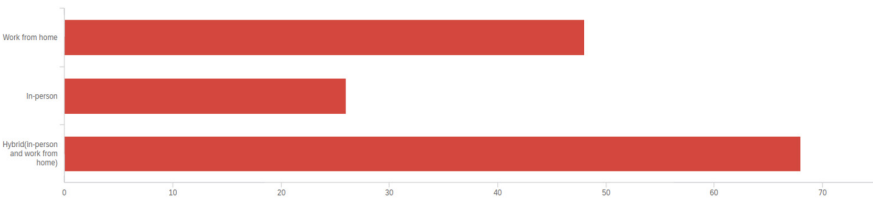
CONCLUSION

From the literature review and the research, it is reasonable to conclude that technology has been significant in keeping employees productive when working from home. Technology can potentially increase productivity, as we saw with the case of Mural and Zoom, and technology can potentially decrease productivity, which was evident with Zoom fatigue and the home work-life imbalance. The collaboration technologies mentioned in this paper helped to pave the way for the digital transformation that has taken place because of the pandemic. Without those technologies, it is possible that employees would have been forced to go back to the office during the pandemic because the economy would collapse otherwise, and doing so would have led to many more deaths related to COVID-19.

The digital transformation is also thanks to state governments responding fast to infrastructure demands and increasing internet speeds in their states. As we saw from the survey, respondents mostly did not notice a change in their productivity when working remotely, further proving this conclusion. Not mentioned in the data analysis section is one more significant statistic from the survey. We found that 75% of the respondents reported their productivity as either slightly or drastically improving during the pandemic due to being sent home to work. Given this conclusion, I expect that more and more companies (that are able) will become more remote. It is only reasonable to assume companies would want to cut costs and make their workforce remote. Remote working was the reason workers were able to keep being productive, and it is the future of the working industry.

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ANTIBIOTIC RESISTANCE OF *NEISSERIA GONORRHOEAE* AND THE EFFECTS OF COMPREHENSIVE SEXUAL EDUCATION OF REDUCING INFECTION RATES IN YOUNG ADULTS

*N*eisseria gonorrhoeae is the causative agent for gonorrhea, a sexually transmitted infection (STI). Because it is a largely prevalent bacterial STI, it is a major public health concern. Typically, sexual education programs teach students in middle school and high school about various STIs and preventative measures. It has been revealed that many students do not receive this education, rather getting an abstinence-only education instead, seen in state legislatures where they emphasize the importance of abstinence. Students are taught to only have sex when they are married, and many do not get their questions answered by their educators. In this thesis, an analysis will be performed to see if there is a correlation between gonorrhea cases in the 15-24 year old age group in the United States and the type of sex education program each state has using statistics pulled from various organizations such as the Centers for Disease Control and Prevention (CDC) and the Guttmacher Institute, a research and policy organization that focuses on sexual and reproductive health and rights. The selected age group was chosen because the CDC reported that this age group makes up 42% of all gonorrhea cases reported in 2019. A comparison of states that provide abstinence-only programs and gonorrhea case numbers will be done to see if there is a correlation. For more precise comparison, a percentage was calculated of infected individuals out of the total population in certain states to help the correlation shine through more. To help combat the spread of antibiotic-resistant strains, comprehensive sex education programs need to be implemented in more states so that more students have access to information and resources while new antibiotics and other drug therapies can be made to counteract antibiotic-resistant strains.

Neisseria gonorrhoeae Overview

Neisseria gonorrhoeae is a Gram-negative diplococcus bacteria that

infects mucosal areas of the human body, including genital (most common), ocular, nasopharyngeal, and anal mucosa. Infections are often asymptomatic in both males and females. When symptoms do appear, infected individuals can have painful urination, discharge, and itchiness. Untreated infections can lead to more severe complications including pelvic inflammatory disease and ectopic pregnancy in women and infertility in both men and women. *N. gonorrhoeae* can also become disseminated, meaning that it has spread throughout part of the body, where it can cause infectious arthritis and endocarditis. Testing for gonococci in the body and diagnosis can be done either through culture or molecular methods, but to determine what strain an infected individual has, a bacterial culture has to be performed to test susceptibility to drug therapies.

Gonorrhea is a sexually transmitted infection. It attaches to sperm cells and is transferred from an infected male to his sexual partners. Women also transmit the infection to their sexual partners, but this mechanism has not been well studied. The bacteria can bind to and enter urethral epithelial cells in a man, but the cell surface must be clear of sialic acid. It is thought that in transmission from women to men, bacterial sialidases desialylate the lipooligosaccharide, which are secreted by the cevicovaginal microbiota in women. After transmission, *N. gonorrhoeae* makes contact with the mucosal epithelium in order to replicate and be transmitted. It releases peptidoglycan and lipooligosaccharide fragments and outer membrane vesicles to activate the Toll-like receptors and innate immune system cells such as macrophages and dendritic cells. Pro-inflammatory cytokines and chemokines are released and signal neutrophils to the site of infection, where they phagocytose gonococci. This creates an exudate, where a mass of cells seeps out of a vessel or organ, and facilitates transmission to a new person.

While gonorrhea affects both men and women, it is easier to see

symptoms in males if symptoms present. Women may have a difficult time determining if symptoms are due to an STI or another type of infection, including urinary tract infections and yeast infections. The CDC's 2019 STD Surveillance Report states that since 2013, reported infection rates have been higher among men (rates increasing 60.6% during 2015-2019) versus women (rates increasing 43.6% during 2015-2019). Rates have also increased across all races and ethnicity groups. Gonorrhea is an infection that is "non-discriminatory," meaning that anyone regardless of gender, age, race, or ethnicity can be infected and that no one group is more likely to have infections versus another group.

Antibiotic Resistance

Antibiotic resistance in itself is a growing problem. This occurs when a bacterium develops mechanisms to render an antibiotic useless, where it can continue to grow and multiply in its environment. *N. gonorrhoeae* developed its resistance through spontaneous mutations in their genes, which is then transferred to other bacterial cells through conjugation and transformation. Transformation occurs when a bacterial cell takes in foreign DNA from the environment, where they are labeled as competent. *N. gonorrhoeae* is capable of taking up DNA from other commensal *Neisseria* species, while conjugal transfer can occur between other *N. gonorrhoeae* strains as well as *Neisseria meningitidis, Escherichia coli,* and *Haemophilus influenzae*. The acquisition of mutated chromosomal genes from a donor via transmission has only been described in the genus *Neisseria* and in a select few from *Streptococcus*.

The first treatment for gonorrhea was sulfonamides in the 1930s, but resistance was widespread by the 1940s. Treatment then was shifted over to penicillin, which was labeled as a "new miracle drug" in the 1940s. After penicillin, aminoglycosides, macrolides, and tetracycline were used as alternative treatments, but strains containing the *tetM* gene (tetracycline resistance protein) were found and tetracycline was removed. The *tetM* gene is also observed in the conjugal transfer between *N. gonorrhoeae* and other species such as *Escherichia coli*. Fluoroquinolones such as ciprofloxacin showed promise for treatment. By the 1990s, South East Asia was dealing with fluoroquinolone-resistant strains and it spread to the United States. By 2007, it was prevalent in the United States and fluoroquinolones were removed from treatment. Cephalosporins such as cefixime and ceftriaxone are the recommended drugs currently, but even these are losing a resistance battle. In March 2018, a man in the United Kingdom had a case of gonorrhea that did not respond to a dual antibiotic treatment of azithromycin and ceftriaxone and needed to have a three day course of intravenous treatment with ertapenem, which is typically reserved for severe infections. Experts are worried that resistance will outpace the production of a new antibiotic

and will start to lead to patient deaths. A recent update by the CDC was released in December 2020 to start recommending an intramuscular dose of 500 milligrams of ceftriaxone for uncomplicated gonorrhea.

While other bacteria species typically shed resistance genes after the antibiotic is discontinued, gonococci does not. Instead, it continues to hold onto these genes and mechanisms. This makes treatment harder as *N. gonorrhoeae* strains are now labeled as multiresistant. Scientists have been trying to develop new drugs to help combat certain strains. There are a few protein synthesis inhibitors currently in clinical trials that include lefamulin and solithromycin. Fluoroquinolones are inhibitors of bacterial topoisomerase. Two examples are delafloxacin and sitafloxacin, along with two more in clinical trials (zoliflodacin and gepotidacin). There is a novel mechanism that is being explored called SMT-571. This is a small antimicrobial molecule that has shown potent *in vitro* activity against many isolates. *In vitro* experiments occur in a glass environment such as a Petri dish, which was used in these experiments. SMT-571 is a promising oral treatment for urogenital, rectal, and pharyngeal infections and is currently undergoing studies and will eventually go into clinical trials. There were also attempts to make a vaccine against gonorrhea, but these all failed in clinical trials due to antigenic variability. Antigenic variability happens when a pathogen can change the surface proteins or carbohydrates to avoid a host immune response. Because of this, it is hard to develop a vaccine that will provide the necessary genetic information for the host immune system cells to recognize the correct antigenic molecules on a pathogen's surface. Even though there are promising therapeutics soon to be in clinical trials, clinical trials take a long time and new resistant strains can come up in the meantime.

What is Comprehensive Sex Education?

The American College of Obstetricians and Gynecologists defines comprehensive sex education as being medically accurate, evidence-based, and age appropriate while including information on the benefits of delaying sexual intercourse and on contraception and barrier protection to prevent unintended pregnancies and infections. They also suggest talking about healthy relationships, gender identity and sexual orientation, and consent and boundaries.

The Guttmacher Institute is a research and policy organization that focuses on sexual and reproductive health. They have complied data from every state and the District of Columbia (D.C.) on their sex education program legislation and update these every month or two months. As of January 1, 2022, only 29 states and D.C. have mandated sex education programs, while 38 states and D.C. have HIV education either as a stand alone program or within conjunction with their sex education program (Figure 1).

Figure 1 States Where Sex Education is Mandated

Guttmacher Institute, as of January 1, 2022
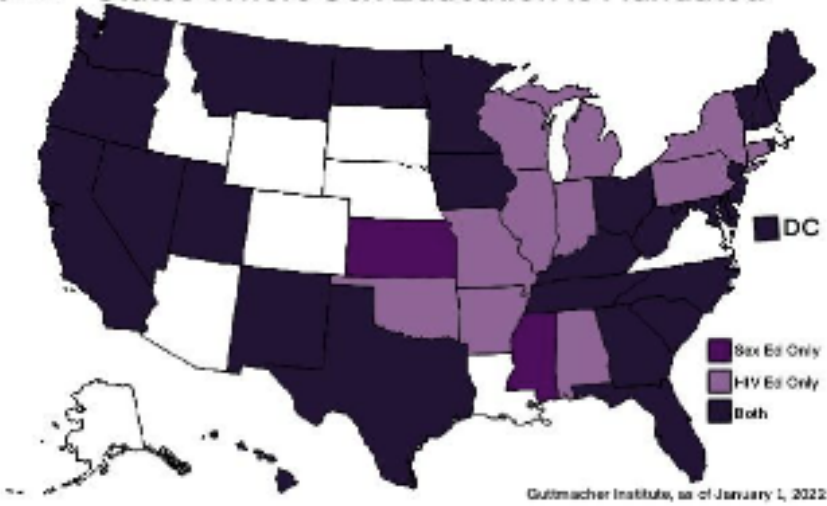
While abstinence is the only way to prevent STIs 100%, many students might not abide by this and instead explore sexuality. Many states have adopted an abstinence only program for students, with 28 states stressing abstinence and 9 states and D.C. covering it (Figure 2). Figure 3 shows 19 states that emphasize of the importance of sex only within marriage, with most of these in the southeast region. Abstinence only until marriage (AOUM) sex education was adopted in the late 1990s with 49 out of 50 states accepting funding for promoting AOUM programs in classrooms. Many studies have shown that abstinence only education has not been effective for students, while comprehensive sex education programs have had an impact on reducing risky behaviors.

Figure 2 States Where Abstinence is Stressed or Covered in Sex Ed

Guttmacher Institute, as of January 1, 2022
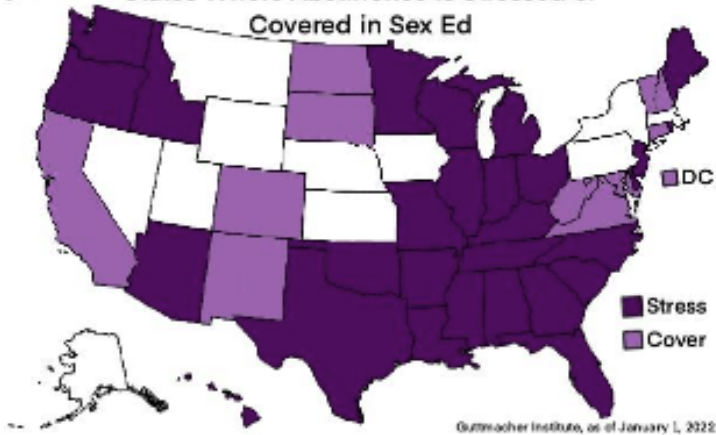
Figure 3 — States that Emphasize Importance of Sex Only Within Marriage

Guttmacher Institute, as of January 1, 2022

COMPARISON OF DATA

The Centers for Disease Control and Prevention (CDC) compiles data from each state and U.S. territories on various diseases. Their most recent gonorrhea case statistics are from 2019, illustrated in Figure 4.

Figure 4 — 2019 Gonorrhea Cases, Age Group 15-24

# of Cases
4-532
538-1745
1755-4125
4429-6924
7634-23988

Legend and data from CDC
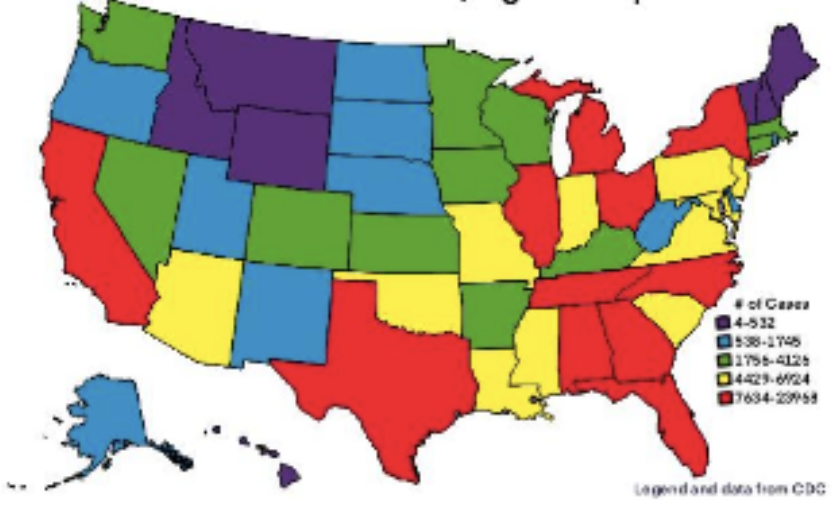
Comparing this to Figures 2 and 3, there is a correlation between states that stress abstinence and a higher number of gonorrhea cases. In this map, purple is the lowest quantile of cases, representing 4-532 cases, then

blue at 538-1,745 cases, then green at 1,756-4,126 cases, then yellow at 4,429-6,924 cases, and lastly red at 7,634-23,968 cases. Many of the states in the southeast stress abstinence and the importance of sex only within marriage and also show up as red on the Figure 4 map. Population in each state does vary and will affect the number of cases. Because of population differences in states, a proportion had to be calculated of infected individuals out of the total population to show a more precise number. The CDC GISP data page has the total population in each state for 2019 along with the case numbers of each states' 15-24 year old infected individuals. Table 1 shows the case numbers, total population of the selected age group, and percentage of cases in each of the states that are red in Figure 4. These states were selected because they were in the highest case number range on the legend, which has a wide range of case numbers (7,634-23,968 cases). After percentages were calculated, it is revealed that even though states like California had one of the highest case numbers in 2019, they only had 0.46% of the population with infections. Alabama has the highest percentage of cases at 1.20%. Outliers are to be expected when doing an analysis like this, such is the case of California and New York being included in the highest range of case numbers despite them not being abstinence-stressing states. Another outlier on the opposite end is Utah, an abstinence-stressing state that only had 955 cases out of a population of 518,499 for the age group (only 0.18%). What is important to note is that there is a significant correlation between most of the states that stress abstinence and a higher percentage of cases for the 15-24 year old age group.

Table 1: Percentages of Cases in Red States in Figure 4 (2019, 15-24 year old age group)			
State	Case Numbers	Total Population (15-24 y.o.)	Percentage
Alabama	7,634	635,707	1.20%
California	23,968	5,180,973	0.46%
Florida	15,287	2,460,558	0.62%
Georgia	9,477	1,449,500	0.65%
Illinois	13,649	1,652,607	0.82%
Michigan	8,821	1,326,325	0.66%
New York	14,033	2,445,246	0.57%
North Carolina	12,293	1,387,060	0.88%

Table 1: Percentages of Cases in Red States in Figure 4 (2019, 15-24 year old age group)			
Ohio	11,836	1,507223	0.78%
Tennessee	7,751	869,205	0.89%
Texas	21,295	4,055,517	0.52%

Another reason for this correlation to not be exact is the fact that the CDC does not have data for 2020 or 2021 (due to the COVID-19 pandemic), and two different years were used to compare as a result. A recent report from the CDC explained that when lockdowns occurred and hospitals were filling with COVID patients, many of the STI clinics were closed down and medical personnel were relocated to help with the virus. For those STI clinics that were able to continue seeing patients, visits to the clinic decreased during the pandemic. Lab testing for COVID was also prioritized while testing for other infections such as STIs were limited. 2020 and 2021 would not make good years to analyze case numbers due to the lockdown measures that took place. In 2020, many people had to work or attend class from home virtually and social spaces were either completely closed or very limited in how many individuals could be in one place with appropriate social distancing for several months, including over the summer when most people would travel on vacation. In 2021, while more places opened up and began to relax COVID policies, STI clinic visits were still impacted. According to a survey mentioned by the CDC, one-third of state and local STI clinic staff were working in COVID impacted areas. Many potential patients were hesitant to go to medical clinics due to risk of exposure to COVID. The COVID policies of wearing a mask, screening beforehand for COVID symptoms, limiting in-person appointments and walk-in availability, and the increase in sanitizing surfaces and hands also played a part in less clinic visits. Even before the pandemic started, many people opted to not go to STI clinics due to lack of insurance, stigma around STIs, and availability of appointments.

Future of Antibiotic Resistance

Despite the promising drug therapies either in or about to start clinical trials, new resistant strains can quickly come up and spread like wildfire if improper management continues. A physician-scientist named Matt McCarthy recently published a book titled *Superbugs: The Race to Stop an Epidemic* where he outlines the history of antibiotics and resistance as well as his experiences developing an antibiotic for a resistant pathogen. The amount of work and legal obligations that researchers go through to develop, test, and manufacture antibiotics takes a long time and can be very tedious. Before clinical trials can even be thought of, an antibiotic needs to be able to perform its mechanism against the targeted bacteria. After this

shows good results, it can be submitted to an IRB board for approval to go to clinical trials. If the IRB board approves the trial, researchers then have to collect patients who would understand that their infection is not guaranteed to be cured just because they are trying a new drug. Once the desired number of trial patients are signed on, the trials can be run and data can be collected. Even after all of this, the new antibiotic could not be as successful as researchers thought it would be and the clinical trial would fail. McCarty talked about his drug therapy dalbavancin and how he was deferred several times before being approved for a clinical trial at the hospital he worked at, then the struggle of having enough patients consent to participate in the trial. Another huge issue he discusses is the problem of drug pricing. After an antibiotic is made, a pharmaceutical company can acquire the rights to it and price gouge, raising the price up to 5,000% or more of what it originally cost. The medical community has seen this happen numerous times with companies and they are unable to stop it. Because of these high prices and the lack of manufacturing of antibiotics as a result, hospitals face shortages of essential medicines. The U.S. Food and Drug Administration (FDA) is responsible for approving drug treatments and for pulling them out of trials or out of recommended regimens once they are deemed ineffective or dangerous for patients. As mentioned before in the Antibiotic Resistance section above, many treatments for gonorrhea were pulled because they grew ineffective. Because of this drawn-out process, medical professionals will start to see more cases such as the U.K. man in 2018 who needed an IV treatment to clear his infection. While this continues, prevention efforts need to be put into place to help slow down the rate of cases and the growing resistance.

CONCLUSION

Comprehensive sex education programs were shown to help decrease risky behaviors in students. Having an open space to learn about contraception, barrier methods such as condoms, and STI symptoms and testing allows for students to be more comfortable in talking about these topics as well as being comfortable using condoms and contraception. Abstinence-only programs limit what students can talk about with their instructor, and often leads to more stigma around STIs and sexual health. It also allows misconceptions to spread, such as the belief that if someone does not present with symptoms, they do not have an STI. The data sourced from the CDC and the Guttmacher Institute demonstrated that abstinence-only programs do play a role in higher gonorrhea case numbers in states versus states where they do not stress abstinence or the importance of sex only within marriage. Despite the attempts in developing and testing new treatment options for gonorrhea, prevention is crucial in combating the rise of cases to allow scientists time to work on the current resistant strains. Comprehensive sex education is the way to help promote prevention. Until another miracle drug

is approved for use, proper education will help slow the spread of resistant strains and prevent long-term effects on infected individuals.

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RACISM IN HEALTHCARE:
A NEGATIVE IMPACT ON HEALTH

T he objective of this paper is to understand racism's presence and influence within healthcare. The proposed research question is, "How does unequal treatment stemming from racism negatively impact minority patients' adherence and satisfaction?" For this paper, a minority patient is defined as any patient identifying as one or more non-Caucasian race or as Latin/Hispanic, and a non-minority patient is any patient identifying as Caucasian without a Latin/Hispanic ethnic background. This paper explores the manifestation of racism and its effect on patient satisfaction, health behaviors, adherence, and overall health. Patient interactions within the healthcare system are intended to positively impact patient health, clinical outcomes, and patient willingness to trust and participate in healthcare systems. However, racism taints healthcare experiences and negatively impacts patient outcomes, perpetuating racially driven health disparities. This study focuses on how implicit bias permeates patient-healthcare provider interactions and relationships and results in minorities receiving inadequate medical treatment. In short, racism within the healthcare setting leads to a decrease in patient adherence and satisfaction, and thus a decline in patient outcomes.

BACKGROUND

Medicine and healthcare continue to be an ever evolving and improving field of study and practice. However, as the overall health of the U.S. population continues to improve, a gap and disparity in healthcare remains and continues to affect the wellbeing of racial and ethnic minorities (Smedley et al., 2003). In fact, minority populations in the U.S. continue to experience higher rates of morbidity, mortality, decreased life expectancy, and decreased access to healthcare when compared to Caucasians (Hall et al., 2015; Smedley et al., 2003).

BY JAYDA HOLLEY

Historically and societally, there is significant evidence of oppression, manipulation, and overall disadvantageous treatment of racial minorities and such attitudes continue to prevail and manifest across time (Winfield, 2007). A limited timeline progresses through the Trail of Tears and the formation of Indian reservations, the Trans-Atlantic slave trade, American slavery, sharecropping, Jim Crow, Japanese internment camps, the Civil Rights Movement, mass incarceration, mass imprisonment and deportation, xenophobia, police bias and brutality, and the list continues. These institutional, individual, overt, and covert manifestations of racism exist in the healthcare sphere as well. These racially motivated constraints place minorities at a disadvantage, evidenced by the decrease in employment and educational opportunities, and an increase in employment of physically demanding jobs (Smedley et al., 2003). Additionally, minorities often live in communities with higher levels of environmental degradation, which includes health hazards, pollution, food insecurity, violence, corporate promotion of poor health behaviors, and more (Smedley et al., 2003). Moreover, health and illness pathology are not studied as thoroughly in minorities. This results in an underrepresentation of minority patients in medical texts, research, and device manufacturing, which is manifested as an educational gap in how to assess, diagnose, and treat minority patients (Kahn & Mian, 2020; Sjoding et al., 2020).

Systemic predisposition to poorer health is compounded as minority patients grapple with a decreased ability to access healthcare (Smedley et al., 2003). Minorities have decreased access to private or employer-provided insurance and therefore are more likely to have publicly funded insurance or be uninsured. Insurance status affects the timeliness, quality, and affordability of preventative, emergent, and routine care but is negatively affected by decreased insurance opportunities available to minorities. Many minorities

also have zero or limited English proficiency and this communication barrier is exacerbated by a lack of interpretation service availability and use. This barrier decreases patient ability to self-advocate, patient-healthcare provider understanding, and patient comprehension of necessary acute and continued care. Additionally, geographical location plays a role in where minorities receive care, who delivers this care, how often they can access this care, and the quality of care received. The convenience of care and how accessing care affects a patient's everyday schedule and obligations, matter substantially in continuing routine health maintenance. Unfortunately, convenience and thus health maintenance, are negatively impacted by a lack of geographical access. The result of these confining factors is that minority patient populations are less likely to have a primary healthcare provider, attend regular checkups, receive follow-up care, and have effective management of chronic health conditions. They are also more likely to utilize emergency care centers, seek care when complications have already occurred, and seek care only as a last resort (Smedley et al., 2003).

When patients and healthcare professionals were asked about these health gaps and why it exists, both sides offered an interesting insight into the relationship between healthcare systems, community health, and racism. Specifically, it seemed as though racism and its effect on patient satisfaction and adherence played a major role in minority patients' propensity, or lack thereof, to seek care, fully utilize healthcare systems, and adhere to treatment regimens (Smedley et al., 2003). This conclusion supports that even when minorities do have access to healthcare, they experience healthcare of a lower quality than their Caucasian counterparts. This lower healthcare quality, which is directly relational to racism, and its negative implications is what will be further explained and assessed in the following sections.

OVERVIEW

While there most definitely are societal, social, historical, and otherwise institutional racially motivated hindrances on the health of minorities, the focus of this review is on how patient-healthcare provider interactions and relationships impact patient satisfaction and adherence (Hall et al., 2015; Peek et al., 2010; Sim et al., 2021; Smedley et al., 2003). It is through this interpersonal perspective of healthcare quality that racism in healthcare will be examined and discussed. The literature review includes a brief look into the student's search strategy and research methodology and includes an analysis of the evidence pertaining to racism in healthcare. The discussion portion of the paper reviews the student's research results, quality assessment of the articles of evidence and research of healthcare data concerning patient demographics, and concludes with a proposed study to further examine racism in healthcare. The conclusion portion of the paper closes by providing a roadmap for continued research, intervention, and

evaluation of racism in healthcare.

LITERATURE REVIEW
Search Strategy and Research Methodology
Articles pertaining to racial bias in healthcare and racially driven health disparities were sourced through Google Scholar. Keywords utilized in sourcing evidence include *racism in healthcare, disparities,* and *implicit bias*. Additional sources were located through searching related articles. The resulting searches, totaling approximately 158,000, were included or excluded for review based on accessibility, reliability, level of evidence standard, and relevance. The 4 peer-reviewed sources were chosen for inclusion in relation to their subject matter, the stated findings, accessibility, readability, publisher, and the vast synthesis of supporting articles, models, and researchers. The data collected and analyzed within these sources reflect a mixed-method analysis and synthesis of the findings.

The topic of research, racism in healthcare, was selected based on the personal interests and curiosity of the student. Therefore, there is a component of researcher bias present in article selection and review. The included articles serve to explore the student's perspective and claim that racism, and its influence, create and perpetuate health disparities that foster the health gap between minorities and their Caucasian counterparts.

Data Analysis
A source included in the conducted research is "Implicit Racial/Ethnic Bias Among Health Care Professionals and Its Influence on Health Care Outcomes: A Systemic Review" (Hall et al.; 2015). According to LoBiondo-Wood and Haber (2018), this study meets a level I evidence standard and functions as a systemic review utilizing data collected from 15 independent studies. The study aims to assess the extent and existence of implicit biases among healthcare professionals towards minorities and how these biases relate to healthcare outcomes of minorities. The conclusion of the study is that implicit bias against minorities is present among healthcare providers across different specialties, levels of training, and levels of experience. This conclusion is supported by the following findings. 1) Implicit bias is significantly related to patient-healthcare provider interactions, treatment decisions, treatment adherence, and patient health outcomes. Subtle biases may be expressed by approaching patients with a dominant or condescending tone, failing to provide interpreters, doing more or less diagnostic work than is generally deemed appropriate, varying recommendations of treatment options based on assumptions of patient adherence, and granting or limiting privileges. As a result, the likelihood that patients feel heard and valued by their healthcare providers and how active a role they can play in their care decreases. 2) Most healthcare providers' implicit bias is exhibited by demonstrating positive attitudes toward Caucasians and negative attitudes

toward minorities. Caucasian Americans tend to associate negative feelings of fear and mistrust with Black Americans. Such group notions, stereotypes, and negative generalizations create automatic thinking that can prevail when working efficiently and quickly and can lead healthcare providers to unintentionally interact with minority patients less effectively than Caucasian patients. Some Caucasian healthcare providers categorize their Black American patients as less intelligent, less able to adhere to treatment regimens, and more likely to engage in risky health behaviors. Negative views are also held in reference to Hispanic/Latino/Latina patients, as they are viewed as unlikely to accept responsibility for their care and more likely to practice nonadherence to treatment recommendations (Hall et al.; 2015).

A source included in the conducted research is "Racism in Healthcare: Its Relationship to Shared Decision-Making and Health Disparities: A Response to Bradby" (Peek et al.; 2010). According to LoBiondo-Wood and Haber (2018), this study meets level I evidence standard and functions as a systemic review utilizing an unspecified number of independent studies for data collection. The study aims to focus on the impact racism has on patient-healthcare provider communication and interaction. The broad conclusion of the study is that race and racism affect the U.S. healthcare system and the patients and healthcare providers who interact within it. This conclusion is supported by the following findings. 1) Racism exists in the U.S. healthcare system as institutional racism. Institutional racism can influence negative health behaviors, such as delays in healthcare utilization and treatment nonadherence. Institutional racism is also associated with poor health measures in which stressed cognitive processes impact physiological responses and result in negative physiological changes in minority patients. 2) Racism exists among healthcare providers as personally mediated racism. Subconsciously enacted personally mediated racism can lead to the formation of stereotypes and over-generalizations in the form of biases and prejudice. Physicians were more likely to rate their Black American patients as less educated, less intelligent, less likely to adhere to treatment regimens, and more likely to abuse drugs and alcohol. 3) Racism exists among patients as internalized racism. Internalized racism manifests as hopelessness, self-devaluation, and limited self-determination and self-expression. Also, minorities perceive healthcare discrimination and accompanying perceptions as being associated with less access to preventative healthcare, prescription medication, and medical testing/treatment. In general, Black Americans reported less participatory physician visits with more physician verbal dominance, less information delivery, and less patient-centered communication than Caucasians. 4) Personally mediated racism and internalized racism negatively impact the patient-healthcare provider relationship by creating a barrier to communication. Race has the potential to

negatively influence shared decision-making in the domains of information sharing and deliberation/physician recommendation and decision-making through cultural discordance, patient beliefs arising from internalized racism, and unconscious healthcare provider bias, or personally mediated racism (Peek et al.; 2010).

A source included in the conducted research is "The Perspectives of Health Professionals and Patients on Racism in Healthcare: A Qualitative Systematic Review" (Sim et al.; 2021). According to LoBiondo-Wood and Haber (2018), this study meets a level I evidence standard and functions as a systematic review utilizing data collected from 23 independent articles. The study aims to examine the role that racial implicit bias has on the creation and continued presence of health disparities between different races. The conclusion of the study is that implicit bias is pervasive and exacerbates health disparities in minority patient populations. This conclusion is supported by the following findings. 1) Implicit bias driving racial supremacism and lack of empathy results in alienation of minority patients. Minority patients are stereotyped as having lower intelligence, leading healthcare providers to limit the information given to patients, oversimplify the information provided, and act in a way that is condescending and dismissive. More overt acts of racism committed by healthcare providers were also reported by minority patients, such as rude facial expressions, reluctance to make skin contact, being unnecessarily rough during physical examinations, avoiding eye contact, and demonstrating cold or withdrawn body language. Minority patients also reported witnessing Caucasian patients being treated better by healthcare providers, stating that in comparison they were met with more disrespectful or harsh interactions and being ignored, rushed, or skipped over instead of receiving the same sociable and polite treatment of their Caucasian counterparts. 2) Implicit bias prompting negative stereotyping of minorities as being of a lower socioeconomic class and having negative health behaviors results in labeling of minority patients. Minority patients are stereotyped as having low socioeconomic status, being less educated, living in poor conditions, and being unable to afford medical services or needing financial support. This may lead healthcare providers to leave out medical regimens and treatment options when presenting care plans to improve health. Minority patients were also reported to be perceived as difficult to appease, dangerous, drug users, sexually promiscuous, or likely to use unsafe sex practices. These false assumptions may lead healthcare providers to be wary or afraid of minority patients or to dismiss patient values and needs. 3) Implicit bias perpetuates racial fault lines, or ways of thinking, by healthcare providers. The healthcare providers stated that they do engage in differential treatment when it comes to their minority patients. However, healthcare providers also reported feeling disconnected from their minority patients,

which led to them being less empathetic and less likely to understand the patient's needs, and being more likely to lose their temper, spend less time with the patient, and using racially derogatory labels. Healthcare providers stated that they do shift blame onto their minority patients when it comes to having poor health or not improving their health. Healthcare providers attributed minorities' poor health not to unequal treatment stemming from racism, but instead to the minority patient's own lack of compliance and poor health behaviors. Healthcare providers also reported that rather than racism taking place, minorities often are oversensitive, victimizing themselves, or playing the race card unnecessarily to gain sympathy or special treatment (Sim et al.; 2021).

A source included in the conducted research is "*Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care*" (Smedley et al.; 2003). According to LoBiondo-Wood and Haber (2018), this is a level I evidence standard and functions as a systematic review utilizing an unspecified number of independent studies for data collection. The study aims to analyze the operation of healthcare systems and to identify disparities in healthcare that are related to racial and ethnic differences. The conclusion of the study is that sources of racial and ethnic disparities in healthcare exist at systemic, care process, and patient levels. This conclusion is supported by the following findings. 1) Racial and ethnic disparities at the systemic level are related to health system administration, financing, accessibility, and geographical location. Complex structures and administrative aspects keep those with low literacy and limited English proficiency from accessing or fully utilizing healthcare systems and services. Contrarily, Caucasian patients generally have higher levels of education and have greater access to and understanding of their presenting concerns and possible diagnostic and treatment options. Distribution of health facilities and allocation of funds to health facilities affect geographical and quality access to healthcare. For example, minorities are typically treated in teaching and training hospitals in segregated healthcare systems based on socioeconomic class. Insurance, or the lack thereof, dictates what kinds and quality of services can be accessed and also influences the likelihood of receiving routine care from a primary healthcare provider. Legal and regulatory tools fail to address racial and ethnic discrimination, whether it be through limited application, inadequate application, or nonenforcement. 2) Racial and ethnic disparities at the patient level are related to clinical appropriateness of care in comparison to a patient's attitudes, preferences, and expectations of healthcare. When given the option, minorities were more likely to choose a racially or ethnically concordant physician to feel as though their experiences, values, and expectations of healthcare will be better understood. Many minorities' preferences for treatment, delay in seeking treatment, and degree of

adherence with treatment are influenced by mistrust of health professionals and systems stemming from patient experiences of racism and a history of segregated, limited, and inferior healthcare. In fact, Caucasian patients tend to feel more comfortable advocating for themselves and urging healthcare providers to provide desired services, treatments, and health outcomes. 3) Racial and ethnic disparities at the care process level are related to physician biases, stereotyping, and uncertainty. Implicit prejudice is demonstrated by healthcare providers through nonverbal behaviors that reflect anxiety, aversion, and avoidance more often when interacting with minority patients. Healthcare providers with negative stereotypes pertaining to minorities either believe these stereotypes as accurate, functional, and appropriate, or they are unaware of their biased thinking and thus it is unintentional. Furthermore, time constraints and having limited patient health information and diagnostic data tend to lead healthcare providers to lean more toward negative stereotypes and generalizations about minority patients' health and health behaviors when making treatment and care decisions. After data adjustment, minorities were found to be less likely to be presented with options for invasive procedures and to receive invasive procedures. Minorities were also less likely to receive specialty referrals and hospital admissions (Smedley et al.; 2003).

DISCUSSION OF RESEARCH FINDINGS

Results

Institutional and personally mediated racism is embedded into the healthcare system and its practicing partners. Such negative and dismissive attitudes contribute to internalized racism and mistrust in healthcare by minorities (Peek et al., 2010; Sim et al., 2021). The result is a vicious cycle that perpetuates and promotes unequal treatment. The health disparity of unequal treatment is directly linked to patient satisfaction and adherence and poor patient outcomes.

This interconnected relationship is essential to the individual because it affects their overall willingness to trust and participate in the healthcare system (Peek et al., 2010; Sim et al., 2021). Negative interactions with healthcare providers and the healthcare system stemming from racism result in mistrust and avoidance in seeking professional medical attention and following medical advice by minority patients (Peek et al., 2010; Sim et al., 2021). This, in turn, leads to impaired health and wellbeing of minorities and could lead to future illnesses and complications that are otherwise preventable.

This interconnected relationship is essential to the general public because it can present an economic burden. As patient satisfaction and adherence decrease, patient outcomes decrease in relation to the increase

in incidence and prevalence of preventable illness and avoidable health complications. The will further exhaust healthcare resources and increase expenditures related to decreased equitable medical intervention. This will continue to tax healthcare economics until intervention is taken to remedy racially motivated health disparities. Furthermore, economic incentive and reimbursement within healthcare drives how care is provided. This is because the financial standing of healthcare facilities is directly tied to patient satisfaction surveys and data on patient outcomes. Naturally, any patient would expect their healthcare team to practice ethically, and in a way that avoids inflicting harm, abides by the obligations to do good, is respectful, and is equitable (Bennett-Woods, 2021). Such ethical practice ensures patient satisfaction; however, racism and its manifestations conflict with ethical practice, impair equitable decision-making, and diminish patient satisfaction, adherence, and health outcomes (Peek et al., 2010). The result negatively impacts healthcare facilities economically as patient population and financial reimbursement decline as a result of the negative public opinion of their facility.

Quality Assessment

Review of the sources revealed several limitations of the included studies and the collected data which may limit the generalizability of the findings. 1) Only articles written in or translated into English were included. This limits population size, limits patient testimonials and perspectives, and could possibly underestimate the degree of racism in healthcare. 2) Input of minority populations experiencing healthcare systems outside the U.S. is limited. This depicts a gap in universal data and application but also a lack of comparison between developed and developing countries and their respective healthcare systems. 3) Universal defining of terms such as racism, including the various forms and manifestations of *racism*, *implicit bias*, etcetera is not conclusive or without variation. This leaves room for various interpretations and applications of institutional and situational occurrences of racism and its manifestations. This could result in some instances being overlooked or omitted or for instances to be overreported. 4) Data are largely collected through patient and provider testimonials. This could lead to individual bias on the part of the subject and altered interpretation on the part of the researching entity.

Despite the limitations, there are aspects that strengthen the validity of the study findings. 1) The sources themselves were representative of a larger collection of independent studies, articles, and scholarly input. The synthesis of such a vast collection of research and data increases the population sample size, the applied research methods, the geographical area of research, and the length of time racial disparities in healthcare have been examined. 2) Populations used in the sample included racial and

ethnic diversity to gather a cohesive perspective of the minority patient. 3) While some inconsistencies were found, the data collected largely reflected the same findings. Therefore, not only were findings supported within the articles, but the sources also served to validate one another.

During the research process, it was also found that there are many barriers to racial and ethnic data collection (Smedley et al.; 2003). Federal, private, and state-supported data are scattered, unsystematic, and do not always include information on race, ethnicity, or primary languages. Data concerning racial and ethnic differences in healthcare are not standardized or available and, in some instances, parties are not cooperative in the data collection. Data collection must comply with the Health Insurance and Portability Accountability Act (HIPAA) in maintaining patient privacy through confidentiality and information securement. Legal constraints may also impose restrictions on when and how data pertaining to a patient's race and ethnicity can be collected. Data collection must be cost-effective and of substantial benefit without compromising the population sample and data validity with convenience sampling. The language and terms used in the discussion of *race, ethnicity, prejudice, discrimination, bias*, whether implicit or explicit, are fluid and socially defined. As a result, concrete definitions, data synthesis, and interpretation are limited (Smedley et al.; 2003).

Student Proposed Study

The student proposed study takes a mixed-method approach on data collection pertaining to racial and ethnic driven health disparities. The sample includes current nursing student peers, actively practicing certified nursing assistants, registered nurses, and medical doctors, and people who are or have been patients. The sample population should be selected at random with no special consideration given to their racial or ethnic background. The purpose of the study is to analyze the presence of racism from the perspectives of healthcare education, healthcare practice, and healthcare experience. Data collection will begin with qualitative data being gathered through open-ended surveys, followed by quantitative data being gathered through responses on a ten-point Likert scale. For both methods of data collection, the focus will be the subject's racial and ethnic background, thoughts and feelings regarding racism, experiences of racism in the healthcare setting, and responses to racism as it relates to patient satisfaction and treatment adherence. Following Institutional Review Board approval, voluntary written informed consent will be obtained from the subjects and survey materials are to be completed solely by the subject without outside interference, suggestion, or influence. Data analysis and synthesis should be conducted by a committee comprising of nursing students and faculty researchers from a variety of racial and ethnic backgrounds and with varying personal beliefs on racism and racially driven health disparities to

minimize bias in the interpretation of collected data. The setting includes the educational and clinical spheres in the state of Georgia. While this setting may limit generalizability of findings, this geographical area allows for diversity of the sample within different corporate healthcare systems in an area with a diverse racial and ethnic population due to geographical demographics, immigration, and international travel.

The findings of the study will help substantiate the science of how racism and its presence in the healthcare setting impacts patient satisfaction and adherence (Hall et al., 2015; Peek et al., 2010; Sim et al., 2021; Smedley et al., 2003). The study is meant to further address the gap in research on minority patients and their healthcare experiences by increasing awareness, recognition, and remediation of racially motivated healthcare disparities. More specifically, the proposed study is meant to analyze these aspects in the area the student intends to practice nursing and will provide a starting point to begin changing healthcare systems and the care provided to better serve the patient population and general population. Participation in the study may result in an increase recognition of racially biased thoughts, feelings, and experiences and demonstrate how patient satisfaction and adherence are tied to these aspects of healthcare. The hypothesis is that a decrease in racially biased thoughts, feelings, and experiences will coincide with an increased level of patient satisfaction and adherence. The measurability of the study is based on how increased satisfaction and adherence leads to improved patient outcomes and overall health.

CONCLUSION

The conducted research and analysis do reflect that unequal treatment stemming from racism negatively impacts minority patients' adherence and satisfaction, resulting in a decrease in positive patient outcomes. The following questions are, where do we go from here and what are the next steps? The plan of remedying unequal treatment stemming from racism needs a multimodal approach. First, there needs to be acknowledgment and accountability in healthcare professionals at all levels of care and patient interaction. The conversation regarding minorities and the health disparities they face must be an open and collaborative exchange. When it comes to medical errors in healthcare practice, the focus is on limiting the consequential damage and preventing recurrence. Rather than playing the blame game, conversations on implicit and explicit instances of racism should be approached in the same way, with a mindset of resolution and health promotion. The goal is to highlight ways healthcare systems can function better for their patients and improve health outcomes through communication, collaboration, analysis, intervention, and evaluation. Individual awareness can be achieved through the reflection of personal thoughts and feelings about minorities, addressing biases within the educational and training curriculum, and being

professionally and personally active in learning and exhibiting cultural competence. Systemic awareness can be achieved through analysis of patient testimonials and the health outcomes associated with adverse or positive healthcare experiences. Second, there needs to be a systemic analysis of minority patients' attitudes and health outcomes and healthcare professionals' attitudes related to minority populations and patients. Also, the terminology needs to be clearly defined and a system for collecting and interpreting such data should be standardized and used in a way that protects patient privacy. Universally defining terms and improving the way in which minority data are collected, organized, and classified minimizes the risk for misinterpretation, misrepresentation, variation, inclusion of irrelevant information, and exclusion of pertinent data. This broader awareness can be assessed through surveys, interviews, anonymous feedback forums, and performing patient reviews. The goal is to assess the care provided, how that care and interaction impacted the patient's health and wellbeing, what care should have been provided, and the influencing factors driving the healthcare professional's decision-making and the resulting care plan. Third, there needs to be a method for the research findings to be utilized and integrated into practice. Simply put, there needs to be a system that reinforces accountability and consequences for actions indicative of racism. Consequences could be but are not limited to, individual reprimand, public disclosure and transparency, department overhaul and retraining, withholding of funding, or utilization of probationary periods. While there should be consequences related to racially driven withholding of care, there should also be an incentive to eradicate such harmful practices. These incentives could be given on an individual level in the form of individual praise and promotion and on a facility/system level in the form of financial incentive and reimbursement or accreditation and acknowledgment of exemplary healthcare facilities.

In conclusion, eliminating unequal treatment stemming from racism will require a complete overhaul in individual and systemic perceptions. This change will not be small or immediate but, instead, will demand continual effort and reassessment for the foreseeable future. Change within the entirety of the healthcare community will take time; however, small-scale change can be made and have an impact on beginning the evolution of healthcare to be more inclusive, understanding, and equitable. Addressing unequal treatment in healthcare that stems from racism, will increase patient satisfaction and adherence and positively affect individual, community, and public health outcomes.

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A COMPREHENSIVE REVIEW OF PRACTICES AND ATTITUDES TOWARD TELEPRACTICE IN PEDIATRIC SPEECH-LANGUAGE PATHOLOGY BEFORE & DURING THE COVID-19 PANDEMIC

Telepractice in pediatric speech-language pathology has grown immensely in its use as a service-delivery model during the COVID-19 pandemic. According to an ASHA survey conducted in May of 2020, approximately 5.2% of school speech-language pathologists were providing services via telepractice before COVID-19. During the COVID-19 pandemic survey period, approximately 81% of school speech-language pathologists were consistently delivering services via telepractice (ASHA, 2020). As schools and clinics began to shut down, telepractice became the primary way of delivering services for some speech-language pathologists. Even when schools and clinics began to reopen, in-person services for medically fragile children may not have been viable, leaving many of these children to attend sessions via telepractice. Many speech-language pathologists had never used telepractice prior to shutdowns resulting from the COVID-19 pandemic (ASHA, 2020).

Research into how the COVID-19 pandemic changed practices and perspectives towards telepractice is necessary given that it is a method that speech-language pathologists are encouraged to provide as a means of meeting IFSP and IEP services. Examining speech-language pathologists' perspectives and practices related to telepractice will help providers expand their understanding of telepractice as a service-delivery model and identify perceived strengths and weaknesses related to this model. Research into how COVID-19 impacted telepractice in speech-language pathology must continue to be explored in order to understand the impacts of the COVID-19 pandemic on the field of speech-language pathology.

In this study, a comprehensive review of the literature about pediatric speech-language pathologists' practices and attitudes toward telepractice before and during the COVID-19 pandemic will be completed

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using studies to date. This study will begin with an overview of telepractice and its history as a service-delivery model in speech-language pathology. The methodology will then explain how the research was reviewed and how the data collected from various studies were analyzed in order to meet with aims of the study. Articles surveying and interviewing speech-language pathologists about their practices and attitudes towards telepractice before and during COVID-19 will be analyzed for comparison between the two time periods. Results of trends and changes in both practices and attitudes of speech-language pathologists toward telepractice prior to and during the COVID-19 pandemic will then be reported. Implications of this research will then be explained, and suggestions for future research will be discussed. This review reveals that while practices, benefits, and challenges existed both prior to and during COVID-19, these aspects changed during COVID-19 due to contextual variances. Key practices discussed include telepractice use, caseload, and training. Key perspectives discussed include challenges and benefits of telepractice.

BACKGROUND

Telepractice has been recognized by the American Speech-Language-Hearing Association (ASHA) as a service delivery model since 2005 (ASHA, n.d.). According to ASHA, "Telepractice is the delivery of services using telecommunication and Internet technology to remotely connect clinicians to clients, other health care providers, and/or educational professionals for screening, assessment, intervention, consultation, and/or education" (ASHA, n.d.). This definition encompasses many types and aspects of telepractice that speech-language pathologists can engage in, including delivering synchronous services, asynchronous services, and hybrid services. Synchronous telepractice services include those services

delivered using real-time video and/or audio equipment to simulate in-person services for assessment, treatment, or consultation. Asynchronous telepractice services include materials, videos, or audio files uploaded to a virtual space by the speech-language pathologist for viewing at a later time by the client or caregivers. Hybrid telepractice services include using a combination of synchronous, asynchronous, in-person, etc. service-delivery models to deliver speech-language pathology services (ASHA, n.d.). Mostly used in pediatric fields, telepractice is still a novel and ever-developing method of service delivery. This service delivery method has been found to be useful in conducting therapy with rural clients because the client does not have to travel or be responsible for transportation to therapy sessions. Telepractice has also aided in providing services to clients when there may be a lack of hired speech-language pathologists in a certain employment setting (Houston, 2014).

In the 17 years since its initial recognition, practices and attitudes towards telepractice in the field have changed drastically. The American Speech-Language-Hearing Association has been studying telepractice in the field of speech-language pathology since the 1990s. Initially, telepractice consisted of clinicians using telephone, email, and Web-based resources to mainly consult with other clinicians (Houston, 2014). Technology has continued to advance, and new software and hardware options for telepractice have been introduced.

Most recently, the COVID-19 pandemic has altered practices and attitudes towards telepractice in speech-language pathology internationally. As stay-at-home mandates and business and school closures went into effect, many speech-language pathologists made the shift to delivering services partially or completely via telepractice. The use of telepractice in pediatric speech-language pathology has grown exponentially during COVID-19 (ASHA, 2020). Studies have begun to be published researching the viability of various therapy methods via telepractice (Raatz, Ward, Marshall, & Burns, 2021).

Understanding changes in telepractice practice during COVID-19 for pediatric speech-language pathologists can further reveal how telepractice can be improved in the future and in case of another global emergency. This can also help clarify what challenges in terms of telepractice are still present that need to be addressed. Research in terms of changes in practices and attitudes towards telepractice can help ensure that telepractice is being provided in an evidence-based manner. Research can also help speech-language pathologists understand how telepractice can be provided in a more equitable manner to all clients. Study into these issues can help make the field of speech-language pathology more research-based and rich in terms of professional inquiry.

There is a dearth of research on telepractice before COVID-19, possibly owing in part to the fact that speech-language pathologists were less likely to engage in telepractice. ASHA's SIG 18, focusing on telepractice, provided resources and research for specialized clinicians using telepractice before and during the pandemic. Most research published before COVID-19 focuses on specific therapy interventions with client subgroups. As research published within ASHA's SIG 18, McGill, Cullen, and Webb (2019) provided evidence that adult clients who stutter, although in-person services were preferred, had positive experiences and outcomes with telepractice. Bridgman et. al. (2016) found the Lidcombe Program for children who stutter was as effective via telepractice as in-person. Little research has been conducted with general pediatric clinicians nationwide, regardless of their use of telepractice in practice, about their perspectives on telepractice. This research seeks to make use of what literature exists about general pediatric speech-language pathologists' use of telepractice and perspectives before COVID-19.

More research exists in regards to telepractice during COVID-19 than before, possibly due to the increased use of telepractice and novel interest in how the COVID-19 pandemic affected the practices of speech-language pathologists. A number of articles examining specific pediatric therapy or assessment procedures via telepractice have begun to be published during COVID-19 (Raatz, Ward, Marshall, & Burns, 2021). More emphasis has also been placed on researching clinicians' perspectives on telepractice, as McGill and Dennard's study of graduate speech-language pathology students' perspectives towards telepractice demonstrates (2021). Pollard and Hogan (2021) surveyed parents and auditory verbal therapists on their perspectives of pediatric auditory verbal habilitation delivered via telepractice. Many articles surveying and interviewing pediatric speech-language pathologists focus on the transition to telepractice during school closures, speech-language pathologists' perspectives on those transitions, and challenges speech-language pathologists faced while implementing telepractice.

Comprehensive reviews on telepractice are limited. Many comprehensive reviews focus on comparisons of specific treatment and assessment techniques delivered in-person versus delivered via telepractice with specific client subgroups (Coleman, Frymark, Franceschini, & Theodoros, 2015). Other reviews focus on reviewing literature studying specific treatment techniques carried out solely via telepractice (Yusuf, Reem, & Hedda, 2020; Brignell, Krahe, et. al., 2021). The aim of this research is to provide a comprehensive review of current literature detailing speech-language pathologists' practices and perspectives on telepractice before COVID-19 as compared to during COVID-19. This information can

provide a deeper understanding of issues relevant to telepractice and can provide suggestions for resolving these issues through future research.

METHOD

In this study, a comprehensive search was completed to compile two sets of articles: one set of articles written before COVID-19 and one set written during COVID-19. Databases searched from which articles were chosen included PubMed, ASHAWire, EBSCO, Medline, and Academic Search Complete. The reference section of each article selected was reviewed to search for further articles. Studies must have been conducted with pediatric speech-language pathologists in the United States. Clinicians' experience with telepractice was not an exclusion factor, and research conducted with speech-language pathologists who were telepractice specialists and who were not telepractice specialists was used. A total of nine articles were found from both timeframes. Uniquely, one of the articles found focused intensely on speech-language pathologists' practices and attitudes towards telepractice retrospectively before COVID-19, as well as presently during COVID-19. Other articles detailed minimal practice aspects retrospectively, such as use of telepractice prior to COVID-19, as a part of research conducted during COVID-19. A meta-analysis was not completed due to differences in research study design, focus, and lack of reliability and validity information from many of the chosen articles.

Description of Methodology of Studies Conducted Prior to COVID–19

The first review timeframe focused on research articles surveying and interviewing pediatric speech-language pathologists about their practices and attitudes towards telepractice from February 2020 and earlier, prior to the onset of COVID-19. Keywords used were "telepractice in speech-language pathology" and "teletherapy in speech-language pathology". Articles from before the onset of the COVID-19 pandemic were chosen when examining clinician perspectives and the use of telepractice with pediatric populations was the focus of the study and when data was derived from direct survey responses or interview answers from speech-language pathologists. Due to limited direct research on speech-language pathologists' practices and attitudes about telepractice before COVID-19, two articles were chosen.

For the two studies conducted prior to COVID-19, the sample population of the first article consisted of school-based speech-language pathologists, while the sample of the second article consisted of ASHA-certified speech-language pathologists working in any setting. The first article interviewed a sample of 5 speech-language pathologists concerning their perspectives on telepractice, while the second article conducted web-based surveys with speech-language pathologists concerning their perspectives on telepractice.

Description of Methodology of Studies Conducted During COVID-19

The second review timeframe focused on research articles surveying and interviewing pediatric speech-language pathologists about their practices and attitudes towards telepractice during COVID-19, from March 2020 onwards. Keywords used were "telepractice in speech-language pathology and COVID-19" and "teletherapy in speech-language pathology and COVID-19". Articles during COVID-19 were chosen when the focus was on speech-language pathologists' uses and perspectives on telepractice. Many of these articles also detailed speech-language pathologists' perspectives and experiences transitioning to delivering services via telepractice during COVID-19. The rapid growth in the number of speech-language pathologists using telepractice during COVID-19 is thought to have directed more research toward this topic. Seven articles were chosen that specifically focused on speech-language pathologists' practices and attitudes towards telepractice during COVID-19.

In the seven studies conducted during COVID-19, all studies consisted of samples of pediatric speech-language pathologists. Some studies had specialized subgroups of participants, such as pediatric speech-language pathologists who worked with AAC, while other studies consisted of samples of pediatric speech-language pathologists working in any setting (Bigs, Therrien, Douglas, & Snodgrass, 2022; Cambell, Goldstein, & Howard, 2021). The sample size varied across the seven articles, ranging from 22 participants to 1,069 participants. The mean number of participants was 452 participants. The majority of studies conducted research via web-based surveys ($n = 5$), while one study conducted interviews, and one study conducted interviews and web-based surveys.

The majority of studies conducted during COVID-19 discuss pertinent practice and employment information, while also reporting participants' perspectives on telepractice during the COVID-19 pandemic. This review reveals common practice and perspective themes toward telepractice during COVID-19.

The chosen articles were then reviewed for common themes in practices and attitudes of speech-language pathologists towards telepractice. These themes were compared in the articles before and during COVID-19 to discover any differences or changes in practices and perspectives of speech-language pathologists towards telepractice. Results are discussed below.

Table 1

Articles Included in Comprehensive Review

Study	Sample Size	Focus of Study	Type of Study
Tucker, J. K. (2012a)	5	Perspectives	Qualitative Interviews
Tucker, J. K. (2012b)	170	Perspectives	Web Survey
Campbell, D. R., & Goldstein, H. (2021)	293	Practices & Perspectives	Web Survey
Sylvan, L., Goldstein, E., & Crandall, M. (2020)	280	Practices & Perspectives	Web Survey
Hall-Mills, S., Johnson, L., Gross, M., Latham, D., & Everhart, N. (2022)	22	Perspectives	Qualitative Interviews
Hao, Y., Zhang, S., Conner, A., & Lee, N. Y. (2021)	61	Practices & Perspectives	Qualitative Interviews & Web Survey
Tambyraja, S. R., Farquharson, K., & Coleman, J. (2021)	1109	Practices & Perspectives	Web Survey
Farquharson, K., Tambyraja, S., & Coleman, J. (2022)	1069	Practices & Perspectives	Web Survey
Biggs, E., Therrien, M. C. S., Douglas, S. N., & Snodgrass, M. R. (2022)	331	Practices & Perspectives	Web Survey

Results

Results include retrospective responses from participants from some studies conducted during COVID-19 on their usage and practices related to telepractice pre-COVID-19. Perspectives on telepractice results prior to COVID-19 are only from articles written prior to COVID-19. While speech-language pathologists can answer to their previous practices retrospectively, answers to their perspectives retrospectively could be biased from current experiences. The current review is able to present the practices and perspectives of pediatric speech-language pathologists on telepractice before COVID-19 from both a qualitative and quantitative view, which also accounts for inherent differences among results based on study design and sample population demographics.

Telepractice Practices Prior to COVID-19

Several common practice themes prior to COVID-19 emerged from the literature review. Telepractice use before COVID-19 was found to be minimal, with percentages ranging based on study year and research design. In an earlier study conducted prior to COVID-19, 1.8% of respondents had experience using telepractice (Tucker, 2012b). In later studies that retrospectively examined speech-language pathologists' experiences prior to COVID-19, the percentage of speech-language pathologists who had experience with telepractice ranged from 8.5-18%, with 11% as a mean (Campbell & Goldstein, 2021; Hao, Zhang, Conner, & Youn Lee, 2021; Sylvan, Goldstein, & Crandall, 2020; Biggs, Therrien, Douglas, & Snodgrass, 2022). This finding of increasingly higher rates over time of speech-language pathologists using telepractice prior to COVID-19 is consistent with the idea that telepractice use increased with time, albeit minimally, in the years before COVID-19 due to technology improvements and other factors.

Speech-language pathologists' caseloads before COVID-19 were found to be, on average, approximately 46 clients (Hao, Zhang, Conner, & Youn Lee, 2021; Tambyraja, Farquharson, & Coleman, 2022). Two studies provided evidence that little to none of the speech-language pathologists' caseloads were served by telepractice prior to COVID-19 (Campbell & Goldstein, 2021; Hao, Zhang, Conner, & Youn Lee, 2021). Examining caseloads prior to and during COVID-19 can further reveal workload and practice changes in pediatric speech-language pathology during COVID-19.

Training in using telepractice as a service delivery model is also an important practice consideration. One study found that, prior to COVID-19, 86.7% of speech-language pathologists received telepractice training before delivering services via telepractice (Tucker, 2012b). While this result from one study cannot be generalized to all speech-language pathologists using telepractice prior to COVID-19, it is worth noting that most speech-language pathologists using telepractice prior to COVID-19 were receiving some form

of telepractice training.

Telepractice Perspectives Prior to COVID-19

Telepractice perspectives in this review refer to speech-language pathologists' opinions, beliefs, and reasons given for using or refraining from using telepractice. Speech-language pathologists' perspectives on telepractice influence their use of telepractice, and this review details common attitudes speech-language pathologists held about telepractice prior to COVID-19.

Perceived Benefits of Telepractice Prior to COVID-19

Speech-language pathologists' perceived benefits of telepractice were a common theme found among perspectives on telepractice in this review. Perceived benefits of telepractice prior to COVID-19 were organized into two main categories: access to speech-language pathology services and client benefit.

Increased Access to Speech-Language Pathology Services. Prior to COVID-19, the most common benefit or reason to use telepractice in this review was access to speech-language pathology services and/or access for rural or long-distance clients (Tucker, 2012a; Tucker, 2012b). Tucker (2012a) found that speech-language pathologists perceived telepractice to be beneficial because clients did not have to travel distances to access speech-language pathology services. It was also noted that telepractice was especially useful in providing access to specialized services, such as bilingual speech-language pathology, that may be impossible to access in person.

Client Benefit. The second most common benefit of telepractice or reason to use telepractice prior to COVID-19 in this review was client benefit (Tucker, 2012a; Tucker, 2012b). Tucker (2012a) found that speech-language pathologists perceived telepractice to increase learning and aid in individualizing programming. Speech-language pathologists' cited being able to send clients therapy materials and increased therapy outcomes as a result of fast-paced telepractice as client benefits.

Increased Training and Collaboration. One study conducted prior to COVID-19 found increased training and collaboration to be a benefit that speech-language pathologists perceived from engaging in telepractice (Tucker, 2012a). Speech-language pathologists perceived increased learning and professional development opportunities for themselves from using telepractice. Speech-language pathologists also perceived that telepractice increased the ability to collaborate with other professionals. Telepractice gave many speech-language pathologists the opportunity to collaborate virtually with other speech-language pathologists and professionals, thus increasing professional development and learning.

Perceived Challenges of Telepractice Prior to COVID-19

Common challenges in regards to telepractice prior to COVID-19 were noted in this review. Common challenges included student candidacy and establishing rapport.

Student Candidacy. Student candidacy was a main challenge speech-language pathologists' faced when delivering telepractice prior to COVID-19 (Tucker, 2012a; Tucker, 2012b). Student candidacy includes issues in determining student eligibility for telepractice in order to ensure services are effective. Speech-language pathologists often cited a need for more research on telepractice effectiveness for various therapy methods and impairments, as well as a need for guidance on whether telepractice is a viable option for students with behavioral challenges (Tucker, 2012a).

Establishing Rapport. Another main challenge found in this review was the difficulty of establishing rapport, or therapeutic relationship, between clinician and client via telepractice (Tucker, 2012a; Tucker, 2012b). It was found that speech-language pathologists often preferred to be in person with clients to be able to engage in hands-on therapy and assessment activities when needed. Many speech-language pathologists cited that telepractice was too impersonal (Tucker, 2012b).

Technology and Access Issues. Another challenge of telepractice prior to COVID-19 found in one study in this review was technology issues and Internet access issues (Tucker, 2012a). This study noted technology failures often served as barriers to telepractice. Technology failure was noted most frequently as a barrier in this study. The most commonly noted technology and access issues noted included computer and website crashes, difficulty using the technology required for telepractice, and lack of or issues with Internet access. Speech-language pathologists noted that procedures describing what to do in these circumstances were warranted. An absence of devices necessary for telepractice was not noted as being a part of access issues prior to COVID-19.

Telepractice Practices During COVID-19

Common practice themes that emerged from the literature review during COVID-19 included high use of telepractice, caseload size, and methods used to provide telepractice.

During COVID-19, most studies noted high percentages of telepractice use (Campbell & Goldstein, 2021; Hao, Zhang, Conner, & Lee, 2021; Tambyraja, Farquharson, & Coleman, 2021; Biggs, Therrien, Douglas, & Snodgrass, 2022). The percentages of telepractice use across studies ranged from 60.5% to 87%, with approximately 72% being the average percentage of telepractice use across studies during COVID-19. Hao et. al. (2021) noted that telepractice use accounted for 57% of participants' caseloads, on average, at its highest point of usage in the study.

Some speech-language pathologists saw, on average, a decrease in caseloads during the COVID-19 pandemic, but others saw little to no changes in caseloads (Hao, Zhang, Conner, & Youn Lee, 2021; Tambyraja, Farquharson, & Coleman, 2021; Sylvan, Goldstein, & Crandall, 2020). Caseloads ranged from 29 to approximately 44 during COVID-19, with employment setting, study design, and other factors accounting for some differences. Sylvan, Goldstein, & Crandall (2020) noted that participants' workloads increased during the pandemic, and approximately 63% of participants had between 31 and 60 clients on their caseloads.

Telepractice training was another common practice issue theme discussed across the chosen articles. It was found that less than 50% of participants had telepractice training prior to transitioning to telepractice during COVID-19 in most studies. Hao, Zhang, Conner, and Lee (2021) found that 50% of interview participants had no formal telepractice training prior to COVID-19, and approximately 68% of survey participants had no formal telepractice training prior to COVID-19. Another study found that only approximately 25% of participants received telepractice training from their districts during COVID-19 (Tambyraja, Farquharson, & Coleman, 2021). Low rates of telepractice training were a common practice theme found in this review during COVID-19.

Telepractice Perspectives During COVID-19

Speech-language pathologists held various perspectives on telepractice during COVID-19. Various factors, such as employment setting and employer guidance, often played a role in influencing speech-language pathologists' perspectives. This review details common perspectives held across articles during COVID-19, including challenges in delivering telepractice and the benefits of telepractice.

Perceived Benefits of Telepractice During COVID-19

During COVID-19, several perceived benefits of telepractice were found. Benefits ranged due to contextual factors and due to the COVID-19 pandemic. Benefits found across studies conducted during COVID-19 were increased parent engagement, increased access to speech-language pathology services, increased training and collaboration, increased availability and creation of digital materials, lowered COVID-19 infection risk, and client benefit.

Increased Parent Engagement. Increased parent engagement was found to be a benefit of telepractice during COVID-19 (Hall-Mills, Johnson, Gross, Latham, & Everhart, 2022; Hao, Zhang, Conner, & Lee, 2021; Sylvan, Goldstein, & Crandall, 2020). In some cases, students needed the assistance of a parent to engage in telepractice, whereas assistance was not needed for in-person therapy, and parents were at home and available for telepractice more. Parents were not as available to be engaged in their child's

therapy prior to COVID-19 when their children were in school and parents were at work. Sylvan, Goldstein, & Crandall (2020) noted that engaging directly with parents allowed for greater generalization of skills and a heavier focus on functional skills. While parent engagement and interactions were increased in some cases, it is worthy to note that parent engagement was a double-edged sword, with parent contact also being a challenge to telepractice in some cases.

Increased Access to Speech-Language Pathology Services. One study noted increased access to speech-language pathology services for some clients, such as those from rural areas (Hao, Zhang, Conner, & Lee, 2021). As noted prior to COVID-19, telepractice can allow for increased access to speech-language pathology services because clients do not have to travel to therapy sessions.

Increased Training and Collaboration. It was found that one study noted increased training opportunities and support from colleagues as benefits of telepractice during COVID-19 (Sylvan, Goldstein, & Crandall, 2020). While COVID-19 disrupted services in speech-language pathology, it also allowed for new clinical training opportunities and experiences using telepractice for the first time for many clinicians. The speech-language pathology community also served as a resource and support network for clinicians during COVID-19 as an increased number of speech-language pathologists began using telepractice.

Increased Availability and Creation of Digital Materials. One study found that speech-language pathologists felt that creating new digital materials and having access to more digital resources was a benefit of telepractice during COVID-19 (Hall-Mills, Johnson, Gross, Latham, & Everhart, 2022). Speech-language pathologists often had to create new therapy materials to suit virtual platforms, and websites and social media were often used to share digital content and materials.

Lowered COVID-19 Infection Risk. Lowering the risk of infection with COVID-19 was stated as the main reason for using telepractice by many clinicians in one study (Campbell & Goldstein, 2021). Telepractice certainly reduces the risk of transmission of COVID-19 because the client and clinician do not have to be in the same room. Lowering COVID-19 infection risk serves as a benefit of telepractice because of its usefulness during the COVID-19 pandemic.

Client Benefit. During COVID-19, one study found that client and family benefit was a benefit of telepractice and a reason to continue using telepractice in the future (Biggs, Therrien, Douglas, & Snodgrass, 2022). This study noted telepractice as a benefit for medically fragile clients. Telepractice benefits clients who may not be able to participate in in-person services for medical reasons, and it benefits clients who may prefer telepractice over in-

person services.

Perceived Challenges of Telepractice During COVID-19

Common telepractice challenges that speech-language pathologists perceived during COVID-19 are noted in this review. Challenges included clinicians' perceived limited proficiency in providing telepractice, technology issues and access issues, reduced parental availability, reduced child engagement, reduced attendance, inconsistent employer guidance and procedures, student candidacy, and establishing rapport.

Limited Proficiency Providing Telepractice. It was found across articles ($n = 3$) that speech-language pathologists often felt limited proficiency in providing telepractice services initially during COVID-19; however, speech-language pathologists' confidence increased with time and experience with using telepractice (Campbell & Goldstein, 2021; Hao, Zhang, Conner, & Lee, 2021; Sylvan, Goldstein, & Crandall, 2020). Speech-language pathology services were greatly impacted by COVID-19, and the fact that many speech-language pathologists did not believe their services were proficient points to a need for greater support for clinicians in future times of service disruptions. Speech-language pathologists' perceived limited levels of proficiency in providing telepractice were a challenge to providing effective telepractice during COVID-19.

Technology and Access Issues. Several studies detailed issues with the technology necessary for telepractice, such as technical failures and limited wifi availability, as some of the most common barriers and challenges of telepractice (Hall-Mills, Johnson, Gross, Latham, & Everhart, 2022; Hao, Zhang, Conner, & Lee, 2021; Tambyraja, Farquharson, & Coleman, 2021; Biggs, Therrien, Douglas, & Snodgrass, 2022). Issues with Internet access for the client and clinician, as well as limited device availability were often noted as challenges to telepractice. It was noted that schools often lacked the infrastructure necessary to provide students and speech-language pathologists with the devices, wifi, and resources needed for a school-wide telepractice program (Hall-Mills, Johnson, Gross, Latham & Everhart, 2022). Internet access and poor Internet connectivity were major challenges noted in many of the studies, and it was noted that often inequities in socioeconomic status led to some students not having the devices or technology necessary to access telepractice. As sudden as the transition to telepractice was, some employers and school districts did not have time to obtain the necessary technical equipment for clients and clinicians.

Reduced Parental Availability. During COVID-19, reduced parental availability and reduced contact with parents was noted as a key challenge to telepractice (Hao, Zhang, Conner, & Lee, 2021; Tambyraja, Farquharson, & Coleman, 2021; Hall-Mills, Johnson, Gross, Latham, & Everhart, 2022; Sylvan, Goldstein, & Crandall, 2020; Biggs, Therrien,

Douglas, & Snodgrass, 2022). Parental assistance was often necessary to get children set up for telepractice, as well as to help children engage in therapy by acting as hands-on assistance for children. Speech-language pathologists often could not get in contact with parents to schedule telepractice sessions, which led to an increase in children who were not having their communication needs met. Some parents also felt that telepractice was too cumbersome to engage in during COVID-19 when other priorities needed to be taken care of (Hall-Mills, Johnson, Gross, Latham & Everhart, 2022). Interestingly, one study found that training parents for telepractice felt like more of a challenge for speech-language pathologists working in high schools and secondary schools than elementary schools, possibly owing to the fact that children being served at higher levels had more complex communication needs (Tambyraja, Farquharson, & Coleman, 2021).

Reduced Child Engagement. During COVID-19, reduced child engagement was a common challenge of telepractice noted across studies (Hao, Zhang, Conner, & Lee, 2021; Tambyraja, Farquharson, & Coleman, 2021; Farquharson, Tambyraja, & Coleman, 2022; Hall-Mills, Johnson, Gross, Latham, & Everhart, 2022). Low levels of child engagement were often noted due to therapy being less hands-on, leading to difficulty engaging younger children. Furthermore, it was often noted that speech-language pathologists felt difficulty in trying to connect with students with complex communication needs via telepractice (Hall-Mills, Johnson, Gross, Latham, & Everhart, 2021). Clinicians often had to use creative methods to find techniques and materials that were engaging to children over a screen. Speech-language pathologists felt that engaging children to participate in therapy effectively via telepractice was difficult during COVID-19.

Reduced Attendance. Another challenge of telepractice during COVID-19 found in this review was reduced attendance (Tambyraja, Farquharson, & Coleman, 2021; Farquharson, Tambyraja, & Coleman, 2022). Poor attendance for telepractice sessions and no-shows were noted by speech-language pathologists as challenges across these studies. One study found a positive correlation between the years of experience speech-language pathologists had and their rates of positive attendance (Tambyraja, Farquharson, & Coleman, 2021). Reduced attendance proved to be another challenge pediatric speech-language pathologists faced during COVID-19.

Inconsistent Employer Guidance and Procedures. Across this review, it was noted that speech-language pathologists often perceived inconsistent employer guidance and procedures as a challenge to telepractice (Hall-Mills, Johnson, Gross, Latham, & Everhart, 2022; Sylvan, Goldstein, & Crandall, 2020). Speech-language pathologists experienced inconsistencies in guidance, experienced unexpected changes in guidance, and experienced unclear guidance that left them without clear direction in their jobs and

telepractice responsibilities. Sylvan, Goldstein, & Crandall (2020) found that in the early days of the pandemic, only around 28% of speech-language pathologists felt that they had all the resources and guidance needed to perform their jobs effectively during COVID-19. This study also found that speech-language pathologists felt that their employers were unprepared for the transition to telepractice, which often resulted in changing and inconsistent guidance (Sylvan, Goldstein, & Crandall, 2020). In this study, speech-language pathologists often felt that employers did not understand the role or scope of practice of speech-language pathologists, leading to difficulties in developing telepractice guidance and procedures. Inconsistent employer guidance and procedures posed a challenge for speech-language pathologists in carrying out telepractice.

Student Candidacy. In one study, it was found that a challenge to telepractice was student candidacy, or the fact that telepractice was difficult to be feasible and effective with certain clients (Campbell & Goldstein, 2021). Some children with complex communication needs can benefit more from in-person therapy, such as when hand-over-hand is needed, rather than telepractice. This study noted a need for more research on telepractice with certain groups of clients.

Establishing Rapport. One study found that speech-language pathologists felt that establishing rapport with new students via telepractice could be challenging (Hall-Mills, Johnson, Gross, Latham, & Everhart, 2022). Clinicians stated that already having rapport with students during the transition to telepractice was different than building rapport with new students entirely via telepractice. This study also found that speech-language pathologists felt that telepractice was not always conducive to building rapport.

Table 2

Summary of Perceived Telepractice Challenges

	Number of Studies from Each Timeframe that Noted Challenges	
	Studies Prior to COVID-19	Studies During COVID-19
Perceived Challenges		
Technology & Access Issues	1	4
Reduced Parental Availability	0	5

Reduced Child Engagement	0	4
Reduced Attendance	0	2
Inconsistent Employer Guidance/Procedures	2	2
Student Candidacy	2	1
Difficulty Establishing Rapport	2	1
Limited Proficiency Providing Telepractice	0	3

Table 3

Summary of Perceived Telepractice Benefits

	Number of Studies from Each Timeframe that Noted Benefits	
	Studies Prior to COVID-19	Studies During COVID-19
Perceived Benefits		
Increased Access to Speech-Language Pathology Services	2	1
Client Benefit	2	1
Increased Parent Engagement	0	3
Increased Training & Collaboration	1	1
Increased Availability & Creation of Digital Materials	0	1

Lowered COVID-19 Infection Risk	0	1

DISCUSSION

Telepractice Practices

In conclusion, this review identified several common practices that were similar in telepractice prior to and during COVID-19; however, this review also found several newly identified practices and perspectives during the COVID-19 pandemic.

Telepractice use increased significantly across studies in this review from prior to COVID-19 to during COVID-19 (Tucker, 2012b; Campbell & Goldstein, 2021; Hao, Zhang, Conner, & Youn Lee, 2021; Sylvan, Goldstein, & Crandall, 2020; Biggs, Therrien, Douglas, & Snodgrass, 2022; Tambyraja, Farquharson, & Coleman, 2021). This finding is consistent with current research that suggests that telepractice use increased at never before seen rates during COVID-19. Prior to COVID-19, all studies in this review reported low rates of telepractice use; however, during COVID-19, telepractice use was reported by significantly more than half of the participants. This finding suggests that COVID-19 introduced telepractice to clinicians who had never had exposure to delivering services via telepractice. This newfound increased rate of telepractice use was sure to bring its own set of new challenges, parameters, and benefits.

Changes in caseload from before COVID-19 to during COVID-19 were variable across this review. During COVID-19, it was noted in some studies that some speech-language pathologists had caseloads that were similar to those in studies prior to COVID-19; however, in some studies, caseload size during COVID-19 was significantly less than caseload prior to COVID-19 (Hao, Zhang, Conner, & Youn Lee, 2021; Tambyraja, Farquharson, & Coleman, 2022; Tambyraja, Farquharson, & Coleman, 2021). This finding suggests that variances in caseload during COVID-19 may have been due to participants working in different settings in pediatric speech-language pathology. Another factor that could have influenced caseload during COVID-19 is speech-language pathologists' inability to contact parents for scheduling appointments or parents declining participation in telepractice services. Overall, further research is warranted to determine what factors may have influenced decreases or stability in speech-language pathologists' caseloads during COVID-19.

Discussion of similarities and differences prior to and during COVID-19 in regards to telepractice training is limited due to limited telepractice training information prior to COVID-19 found in this review. The one study that discussed telepractice training prior to COVID-19 stated

that the majority of speech-language pathologists delivering telepractice received training prior to beginning telepractice (Tucker, 2012b). In contrast to this, it was found in this review that approximately half to less than half of speech-language pathologists delivering telepractice during COVID-19 received telepractice training; however, rates of telepractice training varied widely from study to study (Hao, Zhang, Conner, & Lee, 2021; Tambyraja, Farquharson, & Coleman, 2021). Once again, this suggests that the influence of underlying factors, such as employment setting, state location, years of experience, etc. could have influenced the percentage of speech-language pathologists that received telepractice training in each study. Further research is warranted to determine what factors influenced telepractice training for speech-language pathologists' during COVID-19.

Telepractice Perspectives

In this review, speech-language pathologists' perspectives toward telepractice prior to and during COVID-19 were examined across studies. The results of this review suggest that contextual differences surrounding the COVID-19 pandemic were important in determining speech-language pathologists' perspectives on telepractice during COVID-19. For example, speech-language pathologists perceived lowering the risk of COVID-19 to be a benefit of telepractice in one study, whereas, before COVID-19, this was not a benefit or existing reason to use telepractice.

Perceived Benefits of Telepractice

Prior to COVID-19, providing access to speech-language pathology services for clients who could not attend sessions in person or to limit travel burdens was the main reason for providing telepractice (Tucker, 2012a; Tucker, 2012b). During COVID-19, only one study noted that access to speech-language pathology services was a benefit of telepractice and a reason to use telepractice during COVID-19 (Hao, Zhang, Conner, & Lee, 2021). This finding may suggest that access to speech-language pathology services is implied as a benefit of telepractice in many studies during COVID-19, and access to services was the sole reason for utilizing telepractice during COVID-19. By transitioning to telepractice, clients could still access services when in-person services were not available due to COVID-19. Overall, access to speech-language pathology services is a prominent benefit of utilizing telepractice as a service-delivery method.

Client benefit was another benefit of telepractice found in this review prior to and during COVID-19. Client benefit was a major benefit and reason to use telepractice prior to COVID-19 (Tucker, 2012a; Tucker, 2012b). However, only one study noted client benefit as a perceived benefit of telepractice during COVID-19 (Biggs, Therrien, Douglas, & Snodgrass, 2022). This finding may suggest that speech-language pathologists assumed client benefit was an implied benefit of telepractice during COVID-19

because clients and speech-language pathologists did not always have the choice to transition to telepractice. In many cases, telepractice was mandated during COVID-19, and client benefit would have been an implied reason for this transition to protect clients from COVID-19.

During COVID-19, one of the most commonly noted benefits of telepractice was increased parental engagement (Hall-Mills, Johnson, Gross, Latham, & Everhart, 2022; Hao, Zhang, Conner, & Lee, 2021; Sylvan, Goldstein, & Crandall, 2020). Prior to COVID-19, increased parental engagement was not a noted benefit of telepractice. This difference may stem from the contextual difference that most clients engaging in telepractice in the studies conducted prior to COVID-19 were located in schools and were aided by an assistant while engaging in telepractice during the school day. During COVID-19, most clients engaging in telepractice were located in their homes while schools and clinics were closed, and parental assistance was often necessary for clients to engage in telepractice. This finding further supports the idea that contextual differences in telepractice prior to and during COVID-19 led to different experiences with telepractice for clients and clinicians.

Increased training and collaboration was another benefit of telepractice that was found both prior to and during COVID-19 in this review (Tucker, 2012a; Sylvan, Goldstein, & Crandall, 2020). This finding may suggest that many speech-language pathologists, both prior to and during COVID-19, perceived telepractice to offer professional development and room for collaboration. Telepractice offers an opportunity for speech-language pathologists to expand their practice, and many speech-language pathologists may have felt that they developed stronger clinical skills through gaining experience with telepractice. During COVID-19, there was more opportunity for collaboration in telepractice, as telepractice became used by the majority of speech-language pathologists. Prior to COVID-19, telepractice training was shown in this review to be an integral part of many pediatric telepractice programs, and speech-language pathologists may have seen training as a benefit of participating in telepractice. Overall, this review revealed that speech-language pathologists perceive telepractice to offer more opportunities for training and collaboration.

Increased availability and creation of digital materials was a benefit of telepractice found only in one study conducted during COVID-19 in this review (Hall-Mills, Johnson, Gross, Latham, & Everhart, 2022). The reasoning given behind this benefit was that the increased number of speech-language pathologists using telepractice led to an increased number of digital materials and online resources to create digital materials. This finding of zero studies prior to COVID-19 naming the availability of digital materials as a benefit of telepractice suggests that the number of digital materials

available for therapy may have been much more limited because only a minute percentage of speech-language pathologists were using telepractice regularly. Further research would need to be analyzed in order to confirm this conclusion.

Lowering the risk of COVID-19 infection was a benefit of telepractice discussed only during COVID-19 in one article (Campbell & Goldstein, 2021). This finding that only one study discussed lowering COVID-19 infection risk as a benefit of telepractice was unexpected. This may suggest that many studies conducted during COVID-19 viewed lowering the risk of COVID-19 infection as an implied benefit of telepractice. Lowering the risk of COVID-19 infection was essentially the reason for the drastic transition to telepractice during the pandemic, and many speech-language pathologists may be viewing this benefit as a mandated reason for transitioning to telepractice rather than a benefit. While this result was unexpected, it may be explained by further research.

Perceived Challenges of Telepractice

During COVID-19, a main challenge of telepractice delivery that was identified in this review was speech-language pathologists' perceived limited levels of proficiency in providing telepractice (Campbell & Goldstein, 2021; Hao, Zhang, Conner, & Lee, 2021). This may suggest that limited telepractice training for speech-language pathologists during COVID-19 led many clinicians to feel unprepared for delivering services via telepractice. As discussed earlier, this review also found limited levels of telepractice training provided for speech-language pathologists during COVID-19. Prior to COVID-19, speech-language pathologists' perceived limited proficiency in providing telepractice was not a challenge of telepractice found in this review. The absence of limited levels of perceived proficiency prior to COVID-19 may further suggest that telepractice training has a positive correlation with speech-language pathologists' perceived proficiency in providing telepractice. Prior to COVID-19, the majority of speech-language pathologists providing telepractice received telepractice training, and limited perceived proficiency in providing telepractice was not identified as a challenge. Further research into what factors speech-language pathologists perceive to influence proficiency is warranted to examine this concept.

Another area of challenge in telepractice that was identified both prior to and during COVID-19 was technology and access issues (Tucker, 2012a; Hall-Mills, Johnson, Gross, Latham, & Everhart, 2022; Hao, Zhang, Conner, & Lee, 2021; Tambyraja, Farquharson, & Coleman, 2021; Biggs, Therrien, Douglas, & Snodgrass, 2022). Technology issues refer to issues with computer websites, programs, or hardware needed for telepractice failing, and access issues refer to client or clinician difficulty obtaining devices or Internet access needed for telepractice. One difference this review

noted between technology and access issues prior to and during COVID-19 was that inequity in device availability was a highlighted problem during COVID-19 that was nonexistent prior to COVID-19. During COVID-19, many children from low socioeconomic backgrounds did not have the devices or Internet they needed to access telepractice from their homes during school shutdowns, and schools did not have the resources to provide these devices and Internet. This led to inequity in which clients could access speech-language pathology services via telepractice. Prior to COVID-19, the main technology issues discussed were issues with failing computer programs and hardware, and speech-language pathologists noted a need for standardized procedures of what to do in these instances. While speech-language pathologists also struggled with technology and Internet access issues prior to COVID-19, device issues were noted as more prominent challenges during COVID-19 in this review.

Reduced parental availability was a challenge of telepractice identified in this review only during COVID-19. Several studies noted reduced parental availability as a challenge of telepractice during COVID-19 (Hao, Zhang, Conner, & Lee, 2021; Tambyraja, Farquharson, & Coleman, 2021; Hall-Mills, Johnson, Gross, Latham, & Everhart, 2022; Sylvan, Goldstein, & Crandall, 2020; Biggs, Therrien, Douglas, & Snodgrass, 2022). This may suggest that contextual differences surrounding telepractice prior to and during COVID-19 played a role in what challenges were identified. For example, prior to COVID-19, most studies in this review noted that children were participating in telepractice from schools and a paraprofessional or assistant was present with the student to assist with speech-language pathology services via telepractice. During COVID-19, most children were participating in telepractice from their homes, and the assistance of a parent to help the child participate in speech-language pathology services via telepractice was required. Parents were not always available to assist their children in participating in telepractice, and sometimes speech-language pathologists were unable to contact parents to schedule sessions during COVID-19. Some parents also declined speech-language pathology services via telepractice during COVID-19 for their children. Prior to COVID-19, parental assistance was usually not required for telepractice, and telepractice was an option for parents in choosing how to obtain speech-language pathology services for their child. During COVID-19, telepractice was sometimes mandated for clients, and reduced parental availability became a challenge to telepractice. This finding suggests that contextual differences surrounding the client's location and other factors led to reduced parental availability becoming a main challenge of telepractice during COVID-19.

Reduced child engagement was a challenge of telepractice found only during COVID-19 in several studies in this review (Hao, Zhang, Conner,

& Lee, 2021; Tambyraja, Farquharson, & Coleman, 2021; Farquharson, Tambyraja, & Coleman, 2022; Hall-Mills, Johnson, Gross, Latham, & Everhart, 2022). This finding may suggest that preparation, training, and student candidacy selection criteria prior to COVID-19 led to better student engagement outcomes than during COVID-19. During COVID-19, speech-language pathologists were often not allowed to select telepractice or in-person services based on student candidacy for service-delivery types. Reduced child engagement may have been a byproduct of speech-language pathologists providing services via telepractice for all children due to health and safety concerns surrounding COVID-19, when some children may have been more engaged via in-person services. During COVID-19, more speech-language pathologists were providing telepractice, and the perceived lack of experience and training in telepractice found in this review may have contributed to feelings of reduced child engagement during COVID-19.

Inconsistent employer guidance and procedures posed a challenge for speech-language pathologists engaging in telepractice both prior to and during COVID-19 (Tucker, 2012a; Hall-Mills, Johnson, Gross, Latham, & Everhart, 2022; Sylvan, Goldstein, & Crandall, 2020). In studies conducted prior to COVID-19 in this review, many telepractice programs were fairly new, and employer guidance and procedures were still being developed. During COVID-19 in this review, quick transitions to telepractice left little time to develop consistent employer guidance and procedures for conducting services via telepractice. Furthermore, constantly changing conditions regarding COVID-19 led to changing employer guidance. This finding suggests that more research and standarized guidance is needed for pediatric speech-language pathologists practicing telepractice. This finding reveals that inconsistent employer guidance and procedures in telepractice has been an issue prior to and during COVID-19, and remediation of this issue in the form of suggested guidance and procedures for employers is needed.

Reduced attendance was another challenge of telepractice found only during COVID-19 in this review (Tambyraja, Farquharson, & Coleman, 2021; Farquharson, Tambyraja, & Coleman, 2022). This finding that reduced attendance was a challenge of telepractice only during COVID-19 may suggest that issues with parental availability during COVID-19 led to reduced attendance for speech-language pathology sessions via telepractice. As discussed earlier, reduced parental contact often led to an inability for speech-language pathologists to schedule telepractice sessions for clients. Furthermore, parents often were under immense levels of stress during COVID-19, and many were working from home while assisting their children with school and therapy sessions. High parental stress levels may have led to parents forgetting about scheduled therapy sessions, and high parental stress levels may have led to reduced attendance because parents

may have had other needs to address during therapy sessions.

Student candidacy was noted as a main challenge of telepractice prior to COVID-19, but during COVID-19, only one study in this review noted student candidacy as a challenge of telepractice (Tucker, 2012a; Tucker, 2012b; Campbell & Goldstein, 2021). This finding may suggest that speech-language pathologists often did not have choice in deciding which students would be candidates for telepractice during COVID-19, as in some situations, all clients had to receive services via telepractice due to COVID-19 health and safety concerns. Speech-language pathologists may not have percevied student candidacy guidance as much of a challenge during COVID-19 because student selection for telepractice was oftentimes not happening, as all students were often receiving telepractice. Prior to COVID-19, speech-language pathologists perceived a need for guidance for student selection criteria for telepractice. As COVID-19 becomes endemic, more research in student candidacy and telepractice for various subgroups of clients will likely be warranted.

Establishing rapport with clients was found to be a challenge of telepractice both prior to and during COVID-19 (Tucker, 2012a; Tucker, 2012b; Hall-Mills, Johnson, Gross, Latham, & Everhart, 2022). Prior to COVID-19, speech-language pathologists perceived that telepractice was too impersonal, and both prior to and during COVID-19, speech-language pathologists were concerned about their ability to establish rapport with students. Establishing rapport seems to be a perceived challenge of telepractice that may be inherent to the nature of telepractice, as it does not require client and clinician to meet together in-person. The finding that establishing rapport was a challenge both prior to and during COVID-19 in this review may suggest that further research is warranted on techniques speech-language pathologists can utilize to build rapport with clients via telepractice.

FINAL CONCLUSIONS

Several similarities and differences between practices and perspectives toward telepractice prior to and during COVID-19 were found in this review. This review found that telepractice use increased during COVID-19, while caseload and training rates were found to be variable. Increased access to speech-language pathology services and client benefit were prominent benefits of telepractice prior to COVID-19, but this review suggests that these benefits may have been implied or overlooked when telepractice was often mandated during COVID-19. Increased parent engagement, increased creation and availability of digital materials, and lowering the risk of COVID-19 were benefits of telepractice found only during COVID-19 in this review, and this finding suggests that contextual differences and greater numbers of speech-language pathologists using

telepractice led to these benefits being perceived during COVID-19. Increased training and collaboration was a benefit of telepractice found both prior to and during COVID-19, and this finding suggests that telepractice has been perceived as a professional development opportunity both prior to and during COVID-19. Perceived limited proficiency providing telepractice, reduced parental availability, reduced child engagement, and reduced attendance were challenges of telepractice identified only during COVID-19. This review found that COVID-19 introduced several new challenges of telepractice, possibly due to limited time and resources necessary to make efficient transitions to telepractice and implement new telepractice programs. Technology and access issues, inconsistent employer guidance and procedures, and establishing rapport were found to be challenges identified both prior to and during COVID-19 in this review. This may suggest that these issues need further research and guidance to resolve, as these issues have been prominent for several years. Student candidacy was identified as a challenge prior to COVID-19, but it was only noted minimally as a challenge during COVID-19. This may suggest that speech-language pathologists were often not concerned with student candidacy during COVID-19 because most students were engaging in required telepractice. This review identified these practices and perspectives prior to and during COVID-19. This information can provide guidance for further research into these areas in speech-language pathology. Telepractice is an area of speech-language pathology that is expected to continue to grow, and this review further explores telepractice use and perspectives on telepractice to add to the understanding of how telepractice can continue to be developed for use in the field.

Limitations

In this review, only two articles were found researching speech-language pathologists' practices and perspectives toward telepractice prior to COVID-19. A dearth of research exists prior to COVID-19 concerning speech-language pathologists' practices and perspectives toward telepractice. Conclusions drawn from this review are limited due to only these two articles being reviewed for results prior to COVID-19. In order for further comparisons to be made prior to COVID-19 and during COVID-19, more research would need to be cited. Research prior to COVID-19 can no longer be done, so retrospective research would need to be conducted that carefully considers speech-language pathologists' current experiences during COVID-19 and ensures these current experiences do not bias participants' retrospective answers.

Another limitation of this review is that the studies used in this review had variable study methods and sample sizes. For example, sample sized ranged from 5 to 1109 in this study, and some studies used interviews

as study methods, while others used web surveys. Variances in sample size and study method could have led to variances in results. Due to the limited number of studies on speech-language pathologists practices and perspectives, studies of variable sample size and study method were used in this review. In order to solidify results further, further research would need to be conducted to review studies of similar sample size and study type. Further research on speech-language pathologists practices and perspectives is necessary to allow for more similarity in sample size and study method in future reviews.

Future Research

Further research on speech-language pathologists' practices and perspectives on telepractice is needed, especially as the pandemic continues and begins to become endemic. Research across various points of time during the pandemic will be beneficial to the field of speech-language pathology by revealing best practices in future global emergencies. An opportunity for future research is to examine the perspectives of pediatric speech-language pathologists on telepractice longitudinally, as the pandemic becomes endemic, to observe changes over time in regards to perspectives on telepractice. Another suggestion, revealed in this review by low rates of telepractice training and low confidence during the initial transitions to telepractice, would be to examine the impacts of various telepractice training programs on speech-language pathologists' perceived telepractice proficiency. Research in telepractice will be warranted in the future as the situation surrounding COVID-19 continues to evolve, and documenting speech-language pathologists' experiences during this time will be crucial to developing best practices and improving the field.

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THE RELATIONSHIP BETWEEN HYPOTHALAMIC-PITUITARY-ADRENAL AXIS FUNCTIONING AND THE DEVELOPMENT OF ANXIETY DISORDERS AS A RESULT OF STRESS

T he purpose of this study is to examine current research in both biology and psychology about the role of the Hypothalamic-Pituitary-Adrenal Axis (HPA-Axis) and the onset of anxiety disorders. Particular interest is placed on its role in the development of generalized anxiety disorder (GAD), post-traumatic stress disorder (PTSD), obsessive compulsive disorder (OCD), and major depressive disorder (MDD). There are several hypotheses about the HPA axis and the role it plays in the onset of anxiety disorders and symptoms associated with them, especially when the body is exposed to chronic stress. This study aims to compile and integrate data from both fields to look for commonalities between neurological and therapeutic research findings, trends between anxiety disorders, and identify potential areas of future research. Through this study, it was found that in psychological disorders chronic stress leads to constant elevated levels of cortisol which then damages serotonin (5-HT) receptors, interferes with the negative feedback loop of the HPA Axis, and alters future stress responses. This directly ties in with the diathesis stress model in psychology which states that a combination of both biological predisposition and environmental factors contribute to the development of psychological disorders. It was also found that comorbid symptoms associated with anxiety disorders are also rooted in these disruptions to normal biological functioning. Research in this area is still evolving and there are many unanswered questions. Future research hopes to uncover the specific molecular processes within the body that contribute to the development of an anxiety disorder. A better understanding of these processes could lead to breakthroughs in more effective treatments and medications. An area of interesting research is the use of alternate therapies, such as the use of psychedelics to treat the symptoms of treatment resistant anxiety disorders which will be discussed in this paper. Due to the divisive nature of using compounds like LSD or MDMA, little research has been done

to examine the biological changes, if any, associated with the psychological improvements observed after utilizing these treatment methods. This paper aims to examine current research in this field and propose future areas of discussion regarding the use of psychedelics as a method of studying and treatment for anxiety disorders.

OVERVIEW OF DISCUSSED ANXIETY DISORDERS

In the following literature review, the influence of the Hypothalamic–Pituitary–Adrenal Axis, hereafter referred to as HPA Axis on anxiety disorders will be examined. Particular interest will be placed on its role in the development of generalized anxiety disorder, post-traumatic stress disorder, obsessive compulsive disorder, and major depressive disorder. The onset of these disorders is commonly associated with chronic stress, which is why they have been chosen.

Generalized Anxiety Disorder

Generalized Anxiety Disorder (GAD) is defined by the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) as "Excessive anxiety and worry (apprehensive expectation), occurring more days than not for at least 6 months, about a number of events or activities." Symptoms may include restlessness, fatigue, difficulty with concentration, irritability, and sleep disturbances. Although anxiety is a natural human response, it is not the same as the disorder. People with GAD have frequent, excessive, and pervasive worries that interfere with their daily life.

Post-Traumatic Stress Disorder

Post-Traumatic Stress Disorder (PTSD), is an anxiety disorder that occurs after witnessing or experiencing a traumatic event. There is a wide range of symptoms including, involuntary and intrusive thoughts, unsettling and repeated dreams about the event, flashbacks, dissociation,

depersonalization, dissociative amnesia, avoidance of stimuli related to event, negative beliefs about the world and others, persistent negative mood, detachment, and lack of interest in normal activities. People with PTSD are also prone to hypervigilance, partaking in dangerous, self-destructive activities, sleep disturbances, difficulty concentrating, and overall irritability. While this disorder is most often associated with military service members, anyone can develop PTSD after experiencing trauma.

Obsessive Compulsive Disorder

Obsessive Compulsive Disorder (OCD), is a disorder that includes obsessions- recurrent and intrusive thoughts, urges, or images - which are satiated with compulsions - repeated actions or thoughts that are used to reduce the anxiety caused by the obsessions. The obsessions and compulsions are time consuming and can interfere with daily life. People with OCD are also likely to develop tics.

Major Depressive Disorder

Major Depressive Disorder (MDD), is a disorder marked by a persistent depressive mood. Symptoms include lack of interest and pleasure from activities, significant weight changes, insomnia or hypersomnia, fatigue, feelings of worthlessness, inability to concentrate, rumination, preoccupation with death or dying, and psychomotor issues, such as feeling slowed down or overly restless. The onset of MDD is typically a response to a significant loss, but can be the result of other stressors as well.

OVERVIEW OF THE HYPOTHALAMIC–PITUITARY–ADRENAL AXIS (HPA AXIS)

The HPA Axis includes the hypothalamus and pituitary, located in the central nervous system, and the adrenal glands, located superior to the kidneys. The hypothalamus is responsible for maintaining homeostasis and integrating incoming signals from the central nervous system. It is an important part of the fear response in humans. The pituitary gland, located inferior to the hypothalamus, is responsible for hormone release. It is divided into two sections - the anterior pituitary and posterior pituitary. The anterior pituitary is
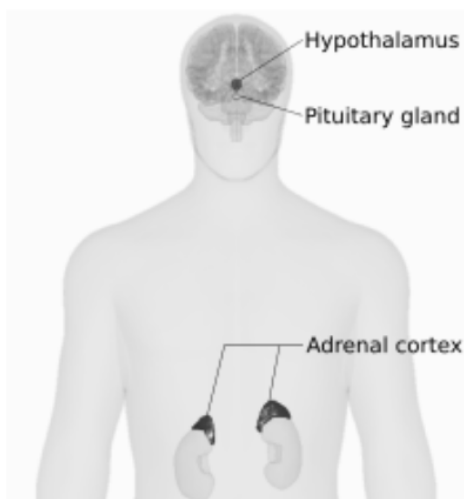
Figure 1: HPA Axis[2]

the portion involved in the stress response. The adrenal gland is responsible for releasing cortisol and is acted on by the pituitary gland.

Release of Adrenocorticotropic Hormone (ACTH)
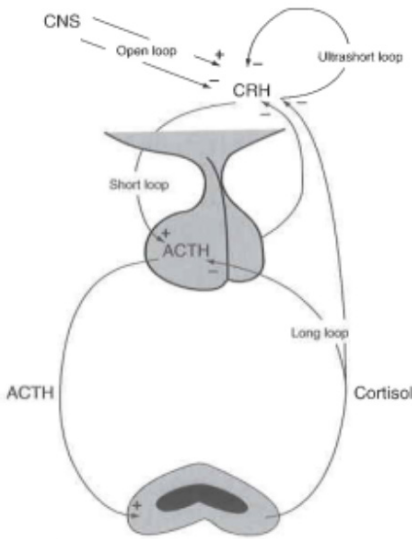
Figure 2: Negative Feedback Loop

When functioning normally, the HPA Axis acts as a negative feedback loop to regulate the stress response. Stress influences the hypothalamus to release corticotropin releasing hormone (CRH) and vasopressin (AVP), which reaches the anterior pituitary through portal blood supply. The anterior pituitary then releases ACTH into the bloodstream where it travels to the adrenal glands. This signals the adrenal glands to release cortisol, inducing the stress response in the body. There are multiple feedback loops that regulate the release of these hormones. There is the short-loop system, where ACTH acts on the hypothalamus to stop the release of CRH and AVP. But, there is also the long-loop system where cortisol and other glucocorticoids feedback on the hypothalamus and anterior pituitary. The final closed loop system is the ultrashort-loop system where CRH acts on the hypothalamus. Lastly there is an open-loop system which is metabolic control of CRH by the CNS.

Release of Beta Endorphin

Beta Endorphin is an endogenous opioid that is synthesized in the anterior pituitary from the precursor protein, proopiomelanocortin (POMC). It is secreted along with ACTH when the body is stressed and is also regulated by the release of CRH from the hypothalamus. It is responsible for blocking pain in the body. High levels of beta endorphin have been shown to suppress the release of CRH, ACTH, and as a result cortisol. This has led many researchers to believe that beta endorphin may have a significant role in regulating and even limiting the effects of the HPA axis during the stress response.

CASE STUDIES AND PREVIOUS EXPERIMENTS

Inhibitory Effects of Beta Endorphin on Cortisol Release from Goldfish

      The aim of this study was to determine the function of circulating beta endorphin in fish, using tissue samples from goldfish head kidneys. The researchers found that ACTH increased cortisol release in the head kidney in a "dose-dependent manner", which means the magnitude of response depends on the amount of the molecule present. It was found that beta endorphin reduced cortisol release in the head kidney. They also found that if ACTH levels remained constant, increasing beta endorphin amount decreased cortisol release in a "dose-dependent manner" implying that these two substances work together to regulate cortisol levels in the body and maintain homeostasis. However, it is important to note that researchers found that "10-fold increase in the concentration of beta endorphin was necessary to attenuate the activity of ACTH". Looking further into the mechanism of this, the researchers found that beta endorphin competitively inhibits ACTH, most likely influencing the signal transduction pathway within the cell. The same process has also been seen in rats, leading scientists to believe that it occurs in most vertebrates.

Effects of Acute and Chronic Stress

      This study compared the physiological response to acute stress, defined as one stressful event, to chronic stress, defined as multiple stressful events. They hypothesized that chronic stress led to changes in the feedback mechanism and receptor sensitivity of both ACTH and beta endorphin. The researchers subjected male, white rats to footshocks in order to induce stress. They were stressed in thirty minute sessions, where they were shocked one second on, to five seconds off. The acute stress group was decapitated and dissected following their first session. The chronic stress group had thirty minute stress sessions daily for fourteen days. They were decapitated and dissected a day after their last session. The third group was called the chronic-acute group. They were subjected to the same schedule as the chronic group but had one extra session immediately before being decapitated. The control group was unhandled rats.

      After examining the tissue samples, the researchers found varying responses dependent on the type of stress inflicted on the rat. The acute stress group showed a "decrease in releasability" of ACTH and beta endorphin. This was accompanied by a "blunted" response when stimulated with arginine vasopressin (AVP). The chronic stress group did not show the blunted response and appeared to have normal releasability of ACTH and beta endorphin. However, the chronic-acute group showed increased releasability of ACTH and beta endorphin after the acute stress. Beta endorphin levels were much higher compared to the control after the acute stress. Researchers believe this is the result of "decreased sensitivity of the

negative steroid feedback".

Environmental Stressors and Epigenetic Control of the Hypothalamic-Pituitary-Adrenal Axis

This article examines the environmental and epigenetic influences on the HPA Axis. They cited stress as the most prevalent environmental influence on HPA Axis functioning, noting that after trauma or chronic stress there are long lasting changes to the HPA Axis and cortisol baseline levels. Epigenetics involves changes in gene expression in the individual organism that does not change the genetic code. Often this is in the form of methylation or acetylation of the DNA. These changes are the result of the organism's environment. One study showed that stress decreased methylation of the corticotropin-releasing factor gene, which resulted in increased expression in mice. When treated with a tricyclic antidepressant, the methylation loss was undone. They believe that humans have a similar process and noted that the same antidepressant undoes the changes to the 'Bdnf' gene that is linked to depression. Another study on the 'Fkbp5' gene, which codes for a chaperone protein utilized in the glucocorticoid receptor signaling complex, found that there is a correlation between reduced methylation of this gene and the development of depression, bipolar disorder, and PTSD. They also found that when adolescent rats were exposed to high levels of glucocorticoids, like cortisol, the methylation changes were observed into adulthood. The methylation also correlated to increased anxiety in adulthood. Similar results were found when comparing lymphocyte cells from human adults that had experienced childhood trauma. Given the results of these case studies, the researchers reached three conclusions: "(1) chronic exposure to stressors or glucocorticoids causes a persistent disruption of the glucocorticoid dynamics; (2) altered cortisol levels cause deterioration of the HPA axis negative feedback and chronic dysregulation of genes that control glucocorticoid signaling and sensitivity, and (3) persistent disturbances in glucocorticoid signaling can have a negative impact on behavior by epigenetic control of genes that regulate mood and neurotransmission".

The β-Endorphin Role in Stress-Related Psychiatric Disorders

This study examined beta endorphin and what role it could play in depression, PTSD, and anxiety. They hypothesized that in clinical depression, there is a disruption to the serotonin, referred to as 5-HT, and beta endorphin interaction. There were several studies that showed an increase in plasma beta endorphin levels after treatment with a tricyclic or SSRI antidepressant intended to increase plasma 5-HT levels. It is thought that there is a 5-HT induced release of beta endorphin, specifically that is altered. This implies that changes in beta endorphin levels may be the result of other depressive symptoms, rather than a causative agent of depression.

The researchers also compared several studies done on anxiety level

and plasma beta endorphin levels. They found that among all of these there was an inverse relationship between anxiety and plasma beta endorphin levels. Similar results were found in rats with PTSD. They had lower beta endorphin concentrations at a basal level. Interestingly, when exposed to a PTSD trigger, the rats beta endorphin concentration increased significantly and remained high hours after the event. This led researchers to hypothesize that an inability to regulate beta endorphin release may lead to the behavioral symptoms of PTSD.

The Role of Life Events and HPA Axis in Anxiety Disorders: A Review

Researchers compiled an overview of the impact stressors in everyday life have on the HPA Axis and development of anxiety disorders. They first looked at the connection between stress and the body's response, finding that chronic stress can result in constant activation of the HPA Axis, which results in increased cortisol levels. This is especially detrimental because increased concentrations of glucocorticoids can damage serotonin receptors.

The data on PTSD did show that there were changes to the HPA Axis and cortisol concentrations, however it varied greatly between test subjects. After rats were exposed to multiple traumatic experiences, including footshocks and social confrontations, the test group displayed very different levels of affectedness. This led researchers to hypothesize that an individual's resilience might influence the onset of PTSD after traumatic events. This means that the individual's perception of the event, feelings of controllability surrounding the event, and even interpersonal relationships can affect the likelihood of developing PTSD. Multiple studies have been done comparing the cortisol levels of people diagnosed with PTSD and those without it. One in particular examined a group of people that had been exposed to an accident. They separated the larger group into groups that were highly affected by observing it and groups mildly affected. They found that five days after the event the highly distressed group had much lower cortisol baseline levels than the lesser affected group. The same was observed two months after the event. However, nine months after the event, the highly distressed groups' cortisol levels had increased from the previous two times. This implies that the symptomology can change over time. The exact cause of this is unknown but several hypotheses have been proposed. Many think that the flashbacks associated with PTSD can be associated with higher cortisol levels after the event. The body perceives that it is in that stressful situation again. Others attributed it to the negative feedback response, which they also believe is responsible for the blunted response later after the traumatic event.

Similar to PTSD, GAD can be onset from chronic stressors, but it has also been found that childhood GAD has been linked to overprotection

and parental pressures that cause the child to develop "anticipatory anxiety" which alters their HPA axis functioning, although few studies have been done on the biological mechanisms behind this. Most data supports the claim that GAD is related to hypercorticism. In fact, one study had people diagnosed with GAD have twenty four weeks of cognitive behavioral therapy. After the therapy a decrease in symptoms and cortisol baseline levels was observed. Many believe this form of therapy could be helpful in recovering normal neuroendocrine functions. Similar to studies with PTSD, losing a sense of control or ability to cope makes it more likely that one will develop anxiety as a result of stressors in their life.

This study also looked at OCD and its connection to the HPA Axis, however compared to the other anxiety disorders there is much less data. Part of this is that it is very difficult to find animal models for OCD. Psychological studies with people have shown that the onset of OCD is often linked to a stressor, and also that stress can exacerbate symptoms of OCD. Given this information, many hypothesize that like other anxiety disorders, the development of OCD is related to the HPA Axis. This is supported by studies that have found elevated levels of cortisol, arginine vasopressin, and CRH in people diagnosed with OCD.

ALTERNATIVE THERAPIES FOR TREATING ANXIETY DISORDERS

Typically, anxiety disorders are treated with a combination of cognitive therapy and medications such as selective serotonin reuptake inhibitors (SSRIs), benzodiazepines, and tricyclic antidepressants. However, in some cases these are not sufficient to effectively treat the symptoms of these anxiety disorders. This is referred to as treatment-resistance. In these special cases, there has been research done on alternative therapies such as psychedelic therapy to treat severe cases. Findings from these studies can further biological understanding of anxiety disorders, while also offering a viable treatment for patients that might not have other options.

Psychedelics and Psychedelic-Assisted Psychotherapy

This article is an overview of multiple studies on the potential uses for psychedelics in treating psychological disorders. Research in this field first began in the 1950's and 60's and has recently observed a renaissance of new research beginning in the 2000's. The results have been promising for the use of MDMA to treat treatment-resistant PTSD and the use of psilocybin for treatment-resistant depression and end of life anxiety. The two compounds fall into two different groups of psychedelics. MDMA is an empathogen, which functions as a mix of serotonin and dopamine release and reuptake inhibitor. The name empathogen is derived from the psychological function, which is a 'heart opener'. Taking MDMA in a safe, therapeutic setting allows

the patient to let their guard down and deal with issues that typically would be too overwhelming to discuss. Psilocybin, on the other hand, is a classic psychedelic derived from a South American mushroom. It is metabolized into psilocin in the body and functions as a serotonin transporter inactivator, which causes changes in sensory perception, including hallucinations.

Three studies of treating PTSD with MDMA were included in this review. Each of them saw positive results with significant reduction in PTSD symptoms for a sustained amount of time. One study in particular, the subjects were given either a placebo or MDMA in two sessions of therapy. They also completed a clinician administered PTSD scale interview. The mean scores before treatment for the placebo group was 79.6 and 79.2 for the MDMA group. Two months after the second session the MDMA group scores had dropped to 25.5 and the placebo was at 59.1. In a follow up 3.5 years after the final session they observed significant relief from symptoms of PTSD.

Several studies were done with psilocybin that took a similar approach. The results from these trials were also successful. In a study set up like the MDMA experiment discussed, the treatment group received 0.3mg of psilocybin per kilogram of body weight and psychological support from two therapists during the trip. 6.5 months after the treatment session 60-80% of the participants had clinically significant reductions in both anxiety and depressive symptoms. A change of greater than or equal to 50% of their original scores in a questionnaire evaluating symptoms of anxiety and depression is considered clinically significant.

Neuroendocrine Associations Underlying the Persistent Therapeutic Effects of Classic Serotonergic Psychedelics

This paper focuses on the neuroendocrine response associated with classical psychedelics, which includes psilocybin, LSD, and DMT. These substances act on the 5-HT2A receptor, and other serotonergic receptors, such as 5-HT2C and 5-HT1A. These receptor types are found in the hypothalamus. They have long term effects after binding and do not have a long-term tolerance. In humans, researchers found that tolerance only occurred after three days of daily doses, but faded within three days after exposure stopped. DMT did not show any tolerance. This is important when deciding on doses for psychedelic psychotherapy. The 5-HT1A receptor in particular has been shown to play a role in "neurogenesis, neuroprotection, depression, anxiety, dopaminergic neurotransmission, thermoregulation, and endocrine function". Taking a psychedelic can also lead to genetic changes. A study found that in rats given LSD, genes related to neuroplasticity and memory are active for several hours after being dosed. The induction of these genes is also observed when treated with antidepressants. Psychedelics influence the brain by "increase[ing] prefrontal and limbic activity and

decreas[ing] amygdala and default mode network activity, a combination that could serve to enhance interoception and cognition while blunting anxiety, fear, and rumination" There are also several studies that indicate psychedelics effect on the HPA Axis, through releasing serotonin in order to stimulate the release of ACTH and cortisol.

DISCUSSION

Throughout all the sources gathered, there is a common understanding that environmental stressors' influence over the HPA Axis has a role in the development of anxiety disorders. When functioning normally, stress is recognized in the amygdala which then triggers the body's stress response. CRH is released from the hypothalamus, which triggers the release of ACTH and beta endorphin from the pituitary, which then modulates the release of cortisol from the adrenal glands. This activates the body's 'flight or fight' response until there is no more perceived stress. After this cortisol levels decrease back to the baseline. However, in psychological disorders chronic stress causes constant elevated levels of cortisol which then damages 5-HT receptors, interferes with the negative feedback loop of the HPA Axis, and alters future stress responses.

The damage of the 5-HT receptors alters the uptake of serotonin, which is responsible for regulating sleep, appetite, and one's mood. This is most likely why people diagnosed with these anxiety disorders also have sleep and appetite disruptions alongside other symptoms more commonly attributed to the disorders. The lack of serotonin also makes it difficult to regulate one's mood, reducing one's ability to cope with future stressors.

Along with damaging 5-HT receptors, elevated levels of cortisol also affect the negative feedback mechanism of the HPA Axis long-term. Cortisol naturally reduces the release of CRH, ACTH, and cortisol itself through negative feedback, however when it is elevated for long periods of time, a long-lasting change in baseline cortisol levels is observed. This is seen in all of the anxiety disorders discussed in this paper. After the onset of these changes to the negative feedback mechanism, future acute stresses then cause extreme reactions and much higher levels of cortisol released than in a normal functioning HPA axis due to increased releasability of ACTH and beta endorphin. It has been hypothesized that this is partially responsible for the behavioral symptoms of GAD, MDD, PTSD, and OCD.

The hypercorticism resulting from the issues with the negative feedback loop are also connected to several epigenetic changes that affect the corticotropin-releasing factor gene and genes that code for proteins involved in the glucocorticoid receptor signaling complex. These changes further affect the ability of the body to mediate the stress response, leading to increased likelihood of developing an anxiety disorder.

Beta endorphin is released alongside ACTH in the stress response

and is presumed to mediate the stress response, by acting as a competitive inhibitor to ACTH. In most anxiety disorders there is a decreased level of beta endorphin observed, meaning that people with these disorders have a difficult time regulating their stress response because a significantly higher concentration of beta endorphin is required to out compete ACTH. Similar to cortisol, after the stressor there is a significant increase in beta endorphin which then alters the negative feedback mechanism, resulting in increased releasability to future stressors. Like cortisol, beta endorphin also interacts with serotonin. There is 5-HT induced release of beta endorphin, which is often linked to MDD. Low serotonin levels result in lower beta endorphin levels, which then leads to issues mediating the stress response.

Given this information about how the HPA axis changes with anxiety disorders, it becomes apparent why the use of psychedelics as an alternative therapy is growing in popularity. The substances used for these therapies help mediate the release of serotonin, ACTH, and cortisol, which scientists think may help mediate the dysregulation of the stress response. Not only do they alter the brain, but the therapy that comes with these sessions is incredibly important in the changes observed. People that have experienced psychedelic therapy claim that it is completely transformational and often leads to an entirely new outlook on their life and self. These substances help people cope, understand, and move past their stress on a psychological level, which then mediates biological changes most likely through neuroplasticity and altering the release of neurotransmitters, although further research is needed to truly understand how this happens.

CONCLUSION

The influence of stress on the HPA Axis creates a negative cycle that only makes the body more susceptible to acute stress and the development of anxiety disorders. The compound effect of disruptions to the HPA axis, genetic predisposition, and the person's environment, especially the environment of their early life all has a role in the development of these disorders and dysregulation of ACTH, beta endorphin, and cortisol.

There are many areas that are lacking in research such as the exact biological mechanisms behind these hypotheses and research on OCD. With advances in technology, more emphasis should be placed on uncovering these biological mechanisms, which could result in new treatments for anxiety disorders. As far as further research on OCD, since it is difficult to find animal models, comparative studies on people have been used thus far. These are helpful in comparing plasma levels of cortisol or beta endorphin, but not for uncovering biological mechanisms. Hopefully in the future a suitable animal model will be found to dive deeper into the biological causes of OCD. In the future, further research should be done on understanding psychedelic therapy as a treatment option for treatment-resistant anxiety

disorders to determine the underlying biology, not only to the initial response, but to the prolonged changes observed in these patients.

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WITHSTANDING THE SHOCK:
EVALUATING THE RELATIONSHIP BETWEEN THERMAL SHOCK AND STRENGTH DEGRADATION IN SAND AND SPANISH MOSS TEMPERED POTTERY

Pottery and ceramics have been created and used globally for thousands of years as tools and technologies to help enhance and improve survival, recreational, and cultural practices. Ceramic technologies, past and present, are created with a wide variety of clay minerals and other constituents, dependent on resource availability in different regions. The primary component of ceramics, clay, provides a plastic material that can be shaped to fit the needs of each potter. Additional organic and inorganic materials, referred to as tempers, may be added to the clay paste to improve the workability and overall final function and performance of a ceramic vessel or product (Rice 1999; Skibo 2013). The type of raw materials, both clay and added tempering agents, are determined by their accessibility, availability, and individual choice. As such, ceramics represent more than the function they were created for: they also represent their location of origin, the original potter, and the culture of the region they were created and used in.

Because of the variety in ceramic technologies, there is a vast realm of possibilities related to the intended functions of recovered ceramic artifacts. Much of the time, full vessels and products are not recovered; instead, small fragments of the original piece left behind as an artifact from a particular culture or group are encountered. Archaeologists are tasked with recovering and interpreting ceramic artifacts to have a deeper understanding of previous cultural groups. Without a clear answer as to what the initial intended function of a vessel may have been, the role of archaeologists includes examining any remaining artifacts and comparing them to our current knowledge base, interpreting the circumstances of recovery to infer possible past usage from the implications of the direct and indirect evidence, and maintaining the archaeological record of recovered artifacts. In order to increase the knowledge base on the recovered artifacts without creating any

further damage to them, archaeologists turn to experimental archaeology, a form of research that involves setting up artificial systems or replications that allow archaeologists to analyze a particular process or phenomenon through systematic testing with controlled variables (Schiffer et al. 1994). Within the context of ceramics, experimental archaeologists are able to conduct experiments and replications that provide information on specific variables relating to performance characteristics, potential intended functions, and mechanical choices. Intended functions can be evaluated by analyzing the technical choices during pottery manufacturing, including but not limited to, morphology, paste composition, surface treatments, and firing temperature (Skibo 2013). Each of these factors plays a role in creating a vessel for a particular purpose, with a variety of performance characteristics impacted by these initial decisions. Understanding the impact of these decisions derives from studying the material remains from the past and creating new ceramics that mirror elements of previously discovered artifacts to conduct experiments on specific variables and components.

This paper aims to deepen our understanding of archaeological contexts of ceramic performance characteristics by expanding on the current research available. The experiment outlined in this paper evaluates and provides quantified data for the relationship between ceramic technologies and thermal shock resistance, the ability to withstand extreme temperature shifts without failure (Bronitsky and Hamer 1986; Li et al. 2014; Tite et al. 2001; West 1992). Ceramic net strength is derived from clay type, organic materials within the clay, naturally occurring minerals, tempering material, firing temperatures and methods, and even the environment where the ceramic firing occurs (Bebber 2017; Bronitsky and Hamer 1986; Rye 1976; Skibo et al. 1989; Tite et al. 2001. As the ceramic specimen is used, continuously shifting between hot and cold temperatures, the net strength

begins to degrade until it results in a failure and is no longer usable (Bronitsky and Hamer 1986; Hasselman 1963; Li et al. 2014; West 1992) This research aims to answer the questions: how does ceramic strength degrade in relation to the amount of thermal shock a ceramic piece is subjected to, and how do tempering agents affect thermal shock resistance? Based on the findings of previous experiments, I hypothesize that the tempered briquettes will have a greater resistance to thermal shock and overall greater strength, and all briquettes will continuously lose net strength in linear relation to the number of thermal shock cycles they are exposed to.

First, this paper will provide background contexts on ceramic materials, tempering agents, previously recovered artifacts, and the findings of other experimental archeologists. Each of the topics is directly related to the current understanding of ceramic artifacts and is crucial in designing and interpreting the results of this experiment. Then, the methods used for both thermal shocking and strength testing are outlined. Next, the results, which include multiple data tables, of both the thermal shock and subsequent force testing will provide insight into how the thermal shock of ceramic pieces impacts the net strength of the ceramic piece and if there is a significant difference in the strength degradation between ceramics exposed to different amounts of thermal shock. Finally, a discussion will conclude this paper by reflecting on the results and how they align with the findings of previous experiments or introducing new interpretations of the current knowledge on ceramic tempers, thermal shock resistance, and strength degradation.

BACKGROUND

Understanding the performance characteristics of ceramic vessels and fragments is a process that involves understanding the material past while experimenting with the attributes archaeologists do not fully understand. Studying the motivations behind the variation in ceramic mechanical functions and performance characteristics aids in understanding changes in technology between different groups over time (Skibo 2013). However, in order to evaluate the motivations of past potters, archaeologists need to understand the impacts of manufacturing and technical choices when creating a ceramic vessel. Archaeologists use experimental approaches to recreate possible conditions and formulas that isolate a particular technical choice and evaluate the impact it has relating to the ceramic's performance (Schiffer et al. 1994). Performance can refer to multiple attributes: stability, accessibility, mechanical strength, workability, thermal shock resistance, cooling effectiveness, and impact and abrasion resistance (Skibo 2013).

This research is focused on analyzing the impacts of adding tempering materials to the clay paste in relation to its strength and overall thermal shock resistance. Thermal shock resistance is the ability of a ceramic or pottery piece to withstand extreme temperature changes and is often measured in the number of thermal shock cycles it takes before crack

propagation shattering of the piece in one or multiple areas (Bronitsky and Hamer 1986; Tite et al. 2001; West 1992). Cracking from thermal shock is caused by the differences in the temperature of the interior and exterior surfaces of the ceramic vessel (Bronitsky and Hamer 1986; Tite et al. 2001; West 1992). As the ceramic is heated, the exterior surface of the piece becomes hotter than the interior, causing the exterior to expand faster than the interior, creating stress on the ceramic piece. When the stress exceeds the new strength of the ceramic, a crack develops on the interior side (Rye 1976). To improve the desired performance characteristics for a ceramic vessel, a tempering material may be added to the clay composition before firing. Tempers are referred to as intentional or naturally occurring non-clay inclusions to the paste composition food to improve workability and overall performance (Skibo et al. 1989:123). Tempering agents include shell, organic fibers, sponge spicules, quartz sand, crushed limestone, grog, and more, each with its own effects on ceramic properties and performance (Bronitsky 1986; Russo and Heide 2004; Wallis et al. 2015). This paper draws on a particular set of tempers that are commonly situated and uncovered within the Southeastern United States: quartz sand and Spanish moss.

The original specific reason for pottery creation remains unverified (Rice 1999); however, there is a provisional timeline of the emergence of pottery in North America, dating back to as early as 4500 years B.P. (Sassaman and Rudolphi 2001; Thompson et al. 2008). Most of the pottery currently identified in the region has origins local to coastal areas in the Southeast, including Florida, Georgia, and South Carolina (Campbell et al. 2004; Rice 1999; Russo and Heide 2004; Thompson et al. 2008). Ceramic varieties have been located along river lines and coastal areas dating back to the Late Archaic Period (ca. 5000–3000 b.p.), including the Stallings series, Orange Series, St. Simons pottery, and Thom's Creek ceramics (Campbell et al. 2004; Russo and Heide 2004; Simpkins and Allard 1986; Thompson et al. 2008). Tempers across these series and locations primarily include sponge spicules, quartz sand, and organic fibers like Spanish Moss, palm fibers, grass, and straw (Rice 1999).

The earliest dated pottery fragments and remains primarily leave traces of organic fiber tempers, identified by the multiple cavities in the ceramic body created after the organic fiber tempers are burnt out during the clay firing, leaving a different impression than other tempers that burn out (Reid 1984). Two primary examples of recovered fiber-tempered ceramics include the Stallings and Orange series (Campbell et al. 2004; Russo and Heide 2004; Simpkins and Allard 1986; Smith and Trinkley 2006). The Stallings series, composed primarily of fiber-tempered wares, has been the subject of numerous interpretations from different archaeologists. While it is clear that an organic fiber temper was used within the clay paste of the Stallings and Orange series, marked by the linear voids within the recovered ceramic sherd, there is a lack of consensus on what exactly the fibers are.

Simpkins and Allard (1986) note that the previously assumed tempers for this series include palmetto fibers, Spanish moss fibers, and grass fibers. Additionally, they note that because the Stalling series was recovered on the coast of South Carolina and Georgia, it is unlikely that Palmetto was used as the tempering material as it does not naturally grow in those regions. This claim is also supported by temper-related literature, including Brain and Peterson (1970), who identified location-specific organic tempers including palmetto fibers in Florida, Spanish moss in Georgia and Florida, and grass fibers in northern Alabama (Brain and Peterson 1970, Campbell et al. 2004). After microscopic analysis of Stallings series sherds, direct evidence of Spanish moss fibers was found, marking Spanish moss as the main tempering material for the Stallings series (Campbell et al. 2004). Additionally, Spanish moss is present in some of the Orange series sherds recovered from the Bluffton Midden (Simpkins and Allard 1986). Finally, fiber-tempered ceramics were gradually replaced by ceramics with other tempering materials as technological advances continued.

While trying to understand the decline of organic fiber tempers, it is essential to evaluate what took their place. The use of quartz sand, in its abundance and availability within the Southeast region, accompanies organic fiber tempers as a primary choice for tempering material. Sand became the dominant tempering material post-1000 B.C., with comparable positive impacts on pottery and ceramic performance characteristics (Hoard et al. 1995; Wallis et al. 2015). This is reflected in the recovery of the Thom's Creek pottery from the coastal areas of South Carolina and Eastern Georgia (Smith and Trinkley 2006). Thom's Creek pottery is marked by its use of sand temper and similar designs to the Stallings series (Sassaman and Rudolphi 2001; Smith and Trinkley 2006; Thompson et al. 2008). This similarity in design can be attributed to close proximity within their recovery and likely interactions between the potters and cultural groups that created them. Decorative styles and morphology may vary between different series and locations, but their continuity with tempering materials, chemical and mineral compositions, and paste composition creates an assortment of pottery and ceramic pieces exclusive to the Southeastern region at the time (Thompson et al. 2008; Wallis et al. 2015). Based on the historical shift in tempering material preference across the Southeast region, this study aims to provide a deeper understanding of why sand overtook organic fibers as the dominant tempering material by examining the possible differences in benefits related to thermal shock among the two materials.

Previous experiments and research have created an outline for methods to follow for this experiment as well as provided a baseline of results that have aided in the prediction of this experiment's results. Bronitsky and Hamer's (1986) experiment examined sand and shell (burned and unburned) as tempering materials and their impacts on thermal shock resistance, impact resistance, weight loss, and overall strength degradation (Bronitsky and

Hamer 1986). Their methods for testing thermal shock resistance were to submerge clay briquettes with an assigned tempering material in boiling water for five minutes and quenching them in ice water immediately after, creating one cycle of thermal shock. Each briquette was assigned to undergo 40 quench testing cycles and, if they did not crack or break, they were tested for strength with an impact test (Bronitsky and Hamer 1986). Their reported results show that repeated cycles of drastic temperature shifts lead to strength degradation or thermal fatigue. Furthermore, the addition of tempering material, sand and shell, within this experiment, increases resistance to thermal shock; however, the tempering material had no significant impact on the peak compression. Finally, they reported that the inclusion of a fine grade temper has a greater resistance to thermal shock than the addition of a coarse temper (Bronitsky and Hamer 1986).

Shortly after, Skibo, Schiffer, and Reid (1989) conducted and published an experiment working with organic materials at tempering materials by looking at the impacts of sand, grass, and manure on ceramic performance compared to untempered pottery. They tested several performance characteristics including thermal shock resistance, heating and cooling effectiveness, abrasion resistance, and paste drying effectiveness (Skibo et al. 1989). Their methods for testing thermal shock resistance closely followed the reported methods of Bronitsky and Hamer (1986). They used the same methods for the thermal shock quench cycles; however, they only did a total of 20 cycles for each briquette. They also used Charpy and Izod impact tests with no notching to report changes in strength for briquettes that withstood all planned thermal shock quench cycles (Skibo et al. 1989). Their results show that the untempered briquettes had a significant decrease in strength after thermal shock, but both the mineral and organic tempered did not show any significant strength reduction between the briquettes that underwent no quench cycles and the briquettes that survived all 20 assigned quench cycles. Further, Skibo and colleagues (1989) performed a freeze-thaw test, consisting of briquettes submerged partially or fully in water and frozen in an environmental chamber at -18 ºC, which presented two different results. For the briquettes fired at 550 ºC, all temper types were damaged after five cycles and showed no clear differences between temper type and failure. Moreover, as firing temperatures increase above 650 ºC, the sand-tempered briquettes resulted in having the highest resistance over the manure and grass tempers (Skibo et al. 1989). These results remain consistent with the findings of Bronitsky and Hamer while including new information on organic fiber tempers.

While the work of Bronitsky and Hamer (1986) provided a solid foundation for future studies on ceramics and thermal shock resistance. Their report was responded to by archaeologist James Feathers (1989). He made multiple comments on possible improvements and clarifications for the methods and procedures outlined in their experiment report. First, he notes

that their use of an artificial clay blend may have impacted their findings, as it is produced to achieve the most desirable performance characteristics (Feathers 1989). Resources collected directly from the environment or a natural clay mixture that has been cleaned and processed might have provided more accurate results. Second, he comments on their described dry time for the briquettes, stating that one hour at 105ºC may not be sufficient enough to evaporate all the absorbed moisture (Feathers 1989). Lastly, his response critiqued Bronitsky and Hamer's method for collecting mechanical strength of the briquettes, specifically noting that using the impact testing method may not provide the most accurate at quantifying strength, especially since it focuses on the energy to create initial fracture and does not provide data on the work of fracture. Instead, Feathers recommends a static bend test to account for both the peak compressive strength and the work of fracture, especially since ceramics may have additional energy between initial fracture and complete failure (Feathers 1989). My methods reflect a mixture of the original methods set forth by Bronitsky and Hamer (1986) and the recommendations outlined by Feathers (1989).

METHODS

To assess levels of strength degradation for tempered ceramics from thermal shock exposure, a series of clay briquettes were made to undergo exposure to extreme hot and cold temperatures, modeled after the methods outlined in Bronitsky and Hamer (1986). Two different tempering materials were studied, quartz sand and Spanish moss, with an untempered series as a control group. 60 briquettes total were studied, with 20 made untempered, 20 made with a sand temper, and the final 20 made with Spanish moss as an organic fiber temper. Both the sand and Spanish moss tempers were added with a volumetric ratio of one-part tempering material to three parts screened dry clay: 200 mL of tempering material to 600 mL of dry clay measured in a graduated cylinder. For the organic fiber-tempered briquettes, the Spanish moss was cut into small pieces with scissors before being added to the dry clay. Both of the tempering agents were homogeneously mixed with the clay before adding water to the composition. Each tempering group was made with controlled, identical characteristics, isolating temper type as the only changing variable throughout groups. The briquettes are composed of Lizella clay and were initially measured to 100mm (3.93in) x 20mm (0.78in) x 11mm (0.43in): these measurements change slightly after firing the briquettes due to water loss and shrinkage. Post-fire measurements of length, width, height, and weight were taken to account for these changes.

After adding water to reach the desired plasticity, each clay composition was kneaded until it did not stick to the touch. Each composition was then rolled to the same height using two square wooden dowel rods to keep the rolling pin at a uniform height. From that rolled clay strip, each briquette was cut using another square wooden dowel rod, measuring 100mm

x 20mm x 11mm, as an outline template. For the organic fiber-tempered clay, the clay slab required drying for approximately 24 hours before cutting briquettes. The Spanish moss fibers began pulling at the fresh mixture, which was altering the briquette size, tearing the briquettes into multiple pieces, and/or creating multiple cracks. After 24 hours of drying, the clay's plasticity decreased enough to allow for the briquettes to be cut to the correct size without tearing or creating cracks. After cutting all the briquettes, all briquettes were left to air dry for a minimum of 72 hours to achieve a leather hard state before firing.

Each series of briquettes was fired individually using a programmable AIM 64KD 227 test kiln equipped with a Bartlett Model 3K controller. The kiln was set to heat at a rate of 10ºC (50ºF) per hour until reaching the target bisque firing temperature of 90.5ºC (195°F). The kiln was held at that temperature for 8 hours to remove any remaining water, as 90ºC is below boiling point. This method differs from Bronitsky and Hamer's methods, as noted by James Feathers that drying briquettes following their method, one hour at 105ºC, may not be sufficient to remove all absorbed moisture (Feathers 1989). Additionally, holding the temperature just below the boiling threshold for 8 hours to remove all moisture is in line with ceramics best practices (Lawres et al., in review). After 8 hours, the kiln's temperature was raised to 700ºC and held for 2.5 hours. The briquettes were then left in the kiln as they gradually cooled and were not removed until they were cooled to room temperature. The fired briquettes were then individually bagged, labeled, and measured before any thermal shock cycles started. Initial measurements of the briquettes included their length, width, height, and weight post-fire.

To analyze the impacts of thermal shock on strength capacity, a series of wash cycles was conducted, consisting of submersion in boiling water followed by quenching each briquette in an ice water bath immediately after. Five briquettes of each temper group were left untested as a control sample to analyze the general strength of each tempering material. Then, the remaining briquettes underwent a set number of cycles of thermal shock. To analyze strength lost over time, the briquettes were assigned a set amount of cycle numbers: including 10, 20, and 40 cycles. Skibo et al. (1989) used 20 cycles in their thermal shock resistance study and Bronitsky and Hamer (1986) used 40 cycles in their study, making 40 the standard amount of cycles to study thermal shock resistance. One cycle included five minutes completely submerged in a beaker of boiling water. The beakers were placed on an Ohaus Guardian 5000 e-G51HS Hotplate set to 400 ºC. After 5 minutes, the briquette was immediately removed from the boiling water bath and quenched in an ice water bath for three minutes. After completing three minutes in the ice water bath, the briquette was cold to the touch and completed one cycle. The cycles were continued until each briquette either exceeded its strength (e.g., cracked) or underwent its total

set number of cycles, whichever occurred first, and were then left to air dry. After completely air-drying, they were rebagged and set for strength testing.

Each briquette that survived all assigned thermal shock wash cycles was subject to ceramic strength testing. Following the recommendation set by Feathers (1989), a three-point bend test was used to analyze the amount of force needed for ceramic strength failure. Testing strength degradation after the thermal shock was conducted using the Mark-10 ESM303 Motorized Test Stand with a Mark-10 Series 5 M5-300 force gauge attachment. The ESM303 is a single-column force tester that can measure and record up to 1500 N of tension and compression (300 lbF). With the ability to record up to 50 measurements a second and moving at a speed of 0.5 mm/min, the test will continuously evaluate the amount of force needed to create an initial fracture and complete failure. The test measures compression and tension peaks in Newtons/meters. To compare the amount of strength lost, the five briquettes from each temper that received no thermal shock after initial firing were tested first to get an initial reading of the required force amount to cause both the initial fracture and a complete failure. Then, the remaining 15 briquettes that underwent the boiling and ice water bath cycles and survived without any cracking or shattering were tested for the same readings. The results were recorded and compared to evaluate any significant differences between both tempering groups and the impact of thermal shock on each ceramic briquette.

RESULTS

The overall purpose of this experiment was to assess the possible strength degradation of ceramic briquettes composed of different tempering agents after exposure to repeated cycles of extreme hot and cold temperatures by comparing the strength testing results of the unaltered briquettes with those that underwent thermal shock cycles. Data was collected on all briquettes except for Spanish Moss-Tempered briquette 20, which broke due to human error before strength testing. The projected results include the sand and Spanish moss-tempered briquettes having a better performance than the untempered briquettes. Additionally, it was hypothesized that the longer the briquettes were exposed to thermal shock cycles, the lower their net strength will be. The data presented outlines the performance of the briquettes related to three factors: peak compression (kN), Modulus of Rupture (N/m²), and Work of Fracture (Nm).

The assessment of peak compression, or load, provides insight into the amount of force load required to create the initial crack or the first instance of strength failure (Bebber 2017). Table 1 provides descriptive statistics for peak compression in all temper groups and no thermal shock exposure. Tables 2, 3, and 4 show the same data for the briquettes of all temper types that were exposed to 10, 20, and 40 thermal shock cycles, respectively.

Table 1. Peak compression values for temper groups with 0 thermal shock cycles. All values are reported in kN.

	Untempered	Sand-Tempered	Spanish Moss-Tempered
Mean	0.0889	0.1129	0.0537
Standard Error	0.004057092555	0.004316827539	0.002985799725
Standard Dev.	0.009071934744	0.009652719824	0.006676451153
Sample Variance	0.0000823	0.000093175	0.000044575
Kurtosis	-0.7972934866	-0.0238457441	1.361135218
Skewness	0.3965871648	-0.7508821211	-0.3090948636
Range	0.023	0.0235	0.0185
Minimum	0.0785	0.0985	0.044
Maximum	0.1015	0.122	0.0625
Count	5	5	5

For the briquettes that underwent no thermal shock exposure (Table 1), the results provide a baseline for the strength of the ceramic varieties post-fire. The sand-tempered briquettes had the highest peak compression at 0.1129kN, followed by the untempered at 0.0889kN, and lastly the Spanish Moss-tempered at 0.0537kN. All three averages are representative of their temper groups as there were no outstanding outliers, shown by a similar range for each temper group. The minima and maxima for the untempered and sand-tempered samples show strong similarities in their ranges, with untempered having a total range of 0.023kN and sand-tempered 0.0235kN.

Table 2. Peak compression values for temper groups with 10 thermal shock cycles. All values are reported in kN.

	Untempered	Sand-Tempered	Spanish Moss-Tempered
Mean	0.0699	0.0946	0.057
Standard Error	0.002633438816	0.004414181691	0.003908324449
Standard Dev.	0.005888548208	0.009870410326	0.008739279146
Sample Variance	0.000034675	0.000097425	0.000076375
Kurtosis	-1.076028359	-1.209277858	-2.286284458
Skewness	0.929486102	-0.4031978271	0.0.6053711383
Range	0.0135	0.024	0.02
Minimum	0.065	0.081	0.0485
Maximum	0.0785	0.105	0.0685
Count	5	5	5

The briquettes that underwent 10 thermal shock cycles show (Table 2) the first changes to ceramic strength after thermal shock exposure. Again, the sand-tempered briquettes had the highest peak compression at

0.0946kN, followed by the untempered at 0.0699kN, and lastly the Spanish Moss-tempered at 0.057kN. The minimum value for the sand-tempered briquettes shows a higher net strength than the maximum values of both the untempered and Spanish Moss-tempered briquettes.

Table 3. Peak compression values for temper groups with 20 thermal shock cycles. All values are reported in kN.

	Untempered	Sand-Tempered	Spanish Moss-Tempered
Mean	0.0867	0.0971	0.0529
Standard Error	0.003382306905	0.004670117772	0.003864582772
Standard Dev.	0.00756306816	0.0104427008	0.008641469782
Sample Variance	0.0000572	0.00010905	0.000074675
Kurtosis	-1.253362023	0.5007199227	-2.774440834
Skewness	0.793328828	-1.006101704	0.683459321
Range	0.018	0.026	0.018
Minimum	0.0795	0.081	0.046
Maximum	0.0975	0.107	0.064
Count	5	5	5

The briquettes that underwent 20 thermal shock cycles (Table 3) show the outcome of longer exposure to thermal shock and how that affects net strength. Again, the sand-tempered briquettes had the highest peak compression at 0.0971kN, followed by the untempered at 0.0867kN, and lastly the Spanish Moss-tempered at 0.0529kN. It should be noted that the minimum (0.081kN) and maximum (0.107kN) values for the sand-tempered are nearly identical to the briquettes that underwent 10 thermal shock cycles.

Table 4. Peak compression values for temper groups with 40 thermal shock cycles. All values are reported in kN.

	Untempered	Sand-Tempered	Spanish Moss-Tempered
Mean	0.0784	0.0812	0.05575
Standard Error	0.001053565375	0.004149096287	0.005452446
Standard Dev.	0.002355843798	0.009277661343	0.010904892
Sample Variance	0.00000555	0.000086075	0.000118917
Kurtosis	4.050401753	0.3617580498	2.457145186
Skewness	1.929264177	-0.650048768	-1.59337785
Range	0.006	0.0245	0.024
Minimum	0.0765	0.0675	0.04

Maximum	0.0825	0.092	0.064
Count	5	5	4

The briquettes that underwent 40 thermal shock cycles (Table 4) show the final results of exposure to thermal shock, following the standard by Bronitsky and Hamer (1986). Again, the sand-tempered briquettes had the highest peak compression at 0.0812kN, followed by the untempered at 0.0784kN, and lastly the Spanish Moss-tempered at 0.05575kN.

The results of this study are unexpected in multiple ways. Looking at the results from the strength testing, none of the briquette temper groups had a linear decrease in strength from 0 thermal shock cycles to 40 thermal shock cycles. When evaluating the untempered briquettes, there was a significant decrease in peak compression value after 10 thermal shock cycles, as shown in previous studies (Li et al. 2014). Then, when evaluating the briquettes that underwent 20 thermal shock cycles, the peak compression was higher than the briquettes that underwent 10 thermal shock cycles and almost the same as the peak compression for the briquettes that underwent no thermal shock. After 40 thermal shock cycles, the briquettes do have a lower peak compression than the 20 thermal shock cycle briquettes, but a higher peak compression than those with 10 thermal shock cycles. A similar trend persisted with the sand-tempered briquettes. While they yielded the best performance with the highest peak compression values overall, their peak compression values fluctuated in a similar manner to the untempered briquettes. The briquettes not exposed to thermal shock cycles had the highest peak compression, followed by the 20-cycle briquettes, then the 10-cycle briquettes, and lastly the 40-cycle briquettes had the lowest peak compression. Lastly, the Spanish Moss-tempered briquettes also show a non-linear relationship with peak compression. The briquettes that underwent 10 thermal shock cycles resulted in the highest peak compression, with the 0-cycle briquettes and 20-cycle briquettes following after, having a 0.008 difference in peak compression values. The briquettes that underwent 40 thermal shock cycles had a higher peak compression than both the 0 and 20-cycle briquettes, being the second highest compression value in the group.

The results neither completely support nor contradict the findings of previous studies as there was a decrease in strength from briquettes not exposed to thermal shock to those that underwent 40 thermal shock cycles; however, there was not a significant loss after the first thermal shock cycle and there was not a linear decrease in strength along with every 10 thermal shock cycles (Bronitsky and Hamer 1986; Bebber 2017; Kilikoglou et al. 1998; Li et al. 2014; Skibo et al. 1989; West 1992). Additionally, the strength of the Spanish Moss-tempered briquettes was significantly lower than both the untempered and sand-tempered briquettes, shown through a lower average peak compression overall. This result contradicts the findings of previous studies, which all note that the addition of a temper increases thermal shock

resistance (Bronitsky and Hamer 1986; Bebber 2017; Kilikoglou et al. 1998; Skibo et al. 1989; Skibo 2013; West 1992). Furthermore, the peak compression values for the Spanish Moss-tempered briquettes showed fluctuations across the different cycle groups and showed an increase in net strength after 40 thermal shock cycles. When looking at the minimum and maximum values for each thermal shock cycle group (0, 10, 20, and 40), there is not much difference between the results. The greatest difference between minimum values was 0.085kN and a difference of 0.06kN for the maximum values. This shows that the net strength across the Spanish Moss-tempered briquettes remained fairly constant throughout all of the thermal shock cycles.

These findings are also represented in the Modulus of Rupture data, which identifies the amount of stress at fracture (Bebber 2017). Table 5 shows the descriptive statistics for the Modulus of Rupture for all temper groups and no thermal shock exposure, and Tables 6, 7, and 8 show the same information for the thermal-shocked briquettes. The values follow the same trend as those for peak compression, with the quartz sand-tempered briquettes having the highest net strength/lowest amount of thermal fatigue.

For the briquettes that underwent no thermal shock exposure (Table 5), the results below provide additional information about the initial strength of the ceramic briquettes. The sand-tempered briquettes had the highest modulus of rupture values at 26250604.87N/m², followed by the untempered at 18267612.01N/m², and lastly the Spanish Moss-tempered 11389734.5N/m². All three averages are representative of their temper groups as there were no outstanding outliers.

Table 5. Modulus of Rupture values for temper groups with 0 thermal shock cycles. All values are reported in N/m².

	Untempered	*Sand-Tempered*	*Spanish Moss-Tempered*
Mean	18267612.01	26250604.87	11389734.5
Standard Error	1039015.305	1485279.953	688509.4866
Standard Dev.	2323308.851	3321186.941	1539554.015
Sample Variance	5397764019383	11030282699555	2370226565683
Kurtosis	-2.0395396	3.604187755	1.470595621
Skewness	0.6821198234	-1.910792684	-0.5271272043
Range	5377835.484	7694547.869	4251286.341
Minimum	16033212.48	20507210.42	9089811.972
Maximum	21411047.96	28201758.29	13341098.31
Count	5	5	5

The briquettes that underwent 10 thermal shock cycles show (Table

6) initial shift in ceramic strength after thermal shock exposure. Again, the sand-tempered briquettes had the modulus of rupture at 20107886.56N/m², followed by the untempered at 14946199.69N/m², and lastly the Spanish Moss-tempered at 14077683.46N/m².

Table 6. Modulus of Rupture values for temper groups with 10 thermal shock cycles. All values are reported in N/m².

	Untempered	Sand-Tempered	Spanish Moss-Tempered
Mean	14946199.69	20107886.56	14077683.46
Standard Error	902635.4125	1515634.435	1128945.299
Standard Dev.	2018354.141	3389061.625	2524398.431
Sample Variance	4073753439350	11485738697200	6372587438051
Kurtosis	3.298126351	0.7021188384	-1.08194638
Skewness	1.829120511	0.3701931921	-0.8440161799
Range	4795506.542	9185246.641	5791283.732
Minimum	13610689	15806970.91	10421571.94
Maximum	18406195.54	24992217.55	16212855.67
Count	5	5	5

The briquettes that underwent 20 thermal shock cycles (Table 7) show the effects of continuous exposure to thermal shock on ceramic strength. Again, the sand-tempered briquettes had the highest modulus of rupture at 21475852.41N/m², followed by the untempered at 17661386.49N/m², and lastly the Spanish Moss-tempered at 11825336.9N/m². The range for the sand-tempered briquettes had a higher range than the untempered and Spanish Moss-tempered briquettes, due to an outlier, Sand-Tempered Briquette 14, which has a significantly higher modulus of rupture than the rest of the sample.

Table 7. Modulus of Rupture values for temper groups with 20 thermal shock cycles. All values are reported in N/m².

	Untempered	Sand-Tempered	Spanish Moss-Tempered
Mean	17661386.49	21475852.41	11825336.9
Standard Error	950738.6672	1468141.732	1034595.193
Standard Dev.	2125916.289	3282864.714	2313425.18
Sample Variance	4519520066264	10777200727743	5351936065645
Kurtosis	2.235901928	0.1409627206	-0.6955773553
Skewness	0.7885851772	0.6748661452	1.059082952
Range	5930258.356	8577628.747	5168449.951

Minimum	15041592.51	17730987.49	10122185.52
Maximum	20971850.87	26308616.24	15290635.47
Count	5	5	5

The briquettes that underwent 40 thermal shock cycles (Table 8) shows how prolonged thermal shock affects ceramic strength. Again, the sand-tempered briquettes had the modulus of rupture at 17041951.08N/m², followed closely by the untempered at 16292951.6N/m², and lastly the Spanish Moss-tempered at 12518343.2N/m². The range for the Spanish Moss-tempered briquettes is notably higher than both the Sand-tempered and untempered, showing an increased variability within this sample set. Additionally, the maximum value for the Spanish Moss-tempered briquettes is similar in value to the minima for both the Sand-tempered and untempered briquettes.

Table 8. Modulus of Rupture values for temper groups with 40 thermal shock cycles. All values are reported in N/m².

	Untempered	Sand-Tempered	S p a n i s h Moss-Tempered
Mean	16292951.6	17041951.08	12518343.2
Standard Error	687450.106	846135.1159	1542918.182
Standard Dev.	1537185.168	1892015.637	3085836.363
Sample Variance	2362938240986	3579723172203	9.52239E+12
Kurtosis	-2.557786699	-1.705830886	2.781963082
Skewness	-0.5748909898	-0.07115530835	-1.62528147
Range	3457397.602	4576323.923	6921620.561
Minimum	14328065.29	14604614.13	8040498.499
Maximum	17785462.89	19180938.05	14962119.06
Count	5	5	4

Similar to peak compression, there was fluctuation in modulus of rupture among the 0, 10, 20, and 40 cycles of each temper group. The modulus of rupture for the untempered briquettes was highest for the briquettes not exposed to thermal shock and decreased after 10 thermal shock cycles. After 20 cycles, the modulus of rupture increased to a value not much lower than the briquettes with no thermal shock exposure. Then, the modulus of rupture for the briquettes that underwent 40 thermal shock cycles decreased again but had a higher value than the 10 thermal shock cycle briquettes. Overall, there was a decrease from the briquettes with no thermal shock to those that underwent 40 cycles, showing that there was a loss of strength and thermal fatigue present. The sand-tempered briquettes again had the best performance out of all temper groups. The results for the sand-tempered briquettes' modulus of rupture also showed a similar fluctuation

in values among the different number of cycles. The briquettes not exposed to thermal shock had the best performance out of any other temper group or number of thermal shock cycles. Then, there was a decrease after 10 thermal shock cycles, followed by a slight increase after 20 cycles, and a steeper decline after 40 thermal shock cycles. Lastly, the Spanish Moss-tempered briquettes had the weakest performance, with the lowest average modulus of rupture. The briquettes exposed to no thermal shock cycles had a lower modulus of rupture value than the briquettes that underwent 10 cycles. Then the briquettes that underwent 20 cycles had a modulus of rupture higher than the 10-cycle briquettes, which was very similar in value to the non-shocked briquettes. Lastly, the modulus of rupture for the 40 cycle briquettes increases again, being the second highest mean value.

Similar to the results of the peak compression, the results of this study neither completely support nor contradict the findings of previous studies. Again, the sand-tempered briquettes had a significantly better performance than the other two temper groups. Furthermore, the Spanish Moss-tempered briquettes had a significantly weaker performance compared to both the untempered and sand-tempered briquettes, contradicting the previous findings that the addition of a temper increases resistance to thermal fatigue and strength loss (Bronitsky and Hamer 1986; Bebber 2017; Kilikoglou et al. 1998; Skibo et al. 1989; Skibo 2013; West 1992). In addition, the Spanish Moss-tempered briquettes show a slight increase in strength after 40 thermal shock cycles, with fluctuation along the other cycle groups.

Finally, the Work of Fracture data, which identifies the amount of strength from the initial crack to complete failure, is outlined for all temper groups (Bebber 2017). The Work of Fracture provides insight into the lifespan of the ceramic piece from the first sign of failure, marked in this experiment by the first crack or peak compression, to complete failure. Table 9 shows the descriptive statistics for the Work of Fracture for all temper groups and no thermal shock exposure, and Tables 10, 11, and 12 show the same information for the thermal-shocked briquettes. There was an error in collecting data for Untempered Briquette 13, resulting in no data collection for the work of fracture, which reduced the sample size to 4 for the untempered briquettes that underwent 20 thermal shock cycles. Similar to the other results of this experiment, the quartz sand-tempered briquettes had the highest values of Work of Fracture, and therefore the greatest toughness.

For the briquettes that underwent no thermal shock exposure (Table 9), the results below provide insight into the strength left in the ceramic briquettes after initial crack propagation until complete failure (i.e., work of fracture). The sand-tempered briquettes had the highest work of fracture values at 0.08489338992Nm, followed by the untempered at 0.05836533691Nm, and lastly the Spanish Moss-tempered 0.04242345704Nm. The sand-tempered briquettes show the greatest strength after crack propagation, with the minimum being comparable in value to the maximum of the untempered

briquettes and over double the minimum value of the Spanish Moss-tempered briquettes.

Table 9. Work of Fracture values for temper groups with 0 thermal shock cycles. All values are reported in Nm.

	Untempered	Sand-Tempered	Spanish Moss-Tempered
Mean	0.05836533691	0.08489338992	0.04242345704
Standard Error	0.005042175113	0.003650300844	0.003207146653
Standard Dev.	0.01127464631	0.008162320826	0.00717139793
Sample Variance	0.00012711764932785	0.00006662348126	0.00005142894827
Kurtosis	-1.157246739	-2.733212622	2.343072413
Skewness	0.0003722224202	0.3129892182	1.243335432
Range	0.02850238329	0.0175765312	0.01930372128
Minimum	0.043735154	0.07714251776	0.0347613552
Maximum	0.072237538	0.094719049	0.05406507648
Count	5	5	5

For the briquettes that underwent 10 thermal shock cycles (Table 10), the results show the changes in the strength left in the ceramic briquettes after initial crack propagation. The sand-tempered briquettes had the highest work of fracture values at 0.08296060995Nm, followed by the Spanish Moss-tempered at 0.05269950689Nm, and lastly the untempered at 0.04406087798Nm. This marks the first instance of the Spanish Moss-temper having greater mean strength than the untempered briquettes. The minimum (0.04205950125Nm) and maximum (0.0610230949Nm) values for the Spanish Moss-tempered briquettes are both higher than the minimum (0.03485097842Nm) and maximum (0.0546466752Nm) values of the untempered briquettes. In addition, the sample variance values for both the untempered and Spanish Moss-tempered briquettes is significantly lower than the values exhibited by the sand-tempered briquettes, showing a decrease in variability among the work of fracture values. This suggests that the untempered and Spanish Moss-tempered samples that have undergone 10 thermal shock cycles there is increased uselife/toughness relative to sand-tempered samples also having undergone 10 thermal shock cycles.

Table 10. Work of Fracture values for temper groups with 10 thermal shock cycles. All values are reported in Nm.

	Untempered	Sand-Tempered	Spanish Moss-Tempered
Mean	0.04406087798	0.08296060995	0.05269950689
Standard Error	0.003867981569	0.008708519898	0.004069997813

Standard Dev.	0.008649069725	0.01947284248	0.009100791779
Sample Variance	0.0000748064071	0.0003791915941	0.000082824411
Kurtosis	-2.563285164	0.8487878002	-2.940893426
Skewness	0.4212625718	0.642311871	-0.3704277418
Range	0.01979569679	0.05221717281	0.01896359365
Minimum	0.03485097842	0.05988551661	0.04205950125
Maximum	0.0546466752	0.112102689	0.0610230949
Count	5	5	5

For the briquettes that underwent 20 thermal shock cycles (Table 11), the data indicates how the strength of the ceramic briquettes changes following initial fracture propagation and increased thermal shock exposure. The sand-tempered briquettes had the highest work of fracture values at 0.06597796451Nm, followed closely by the untempered at 0.06507569849Nm, and lastly the Spanish Moss-tempered at 0.04524954435Nm. It should be noted that the sample size for the untempered briquettes was reduced to 4 after a reading error from the Mark-10 ESM303. The difference between the Sand-tempered and untempered mean work of fracture values is 0.0009022661Nm, noting a highly similar strength after initial fracture propagation. Furthermore, Untempered Briquette 16 had the maximum (0.09627463251Nm) work of fracture value for all briquettes that underwent 20 thermal shock cycles.

Table 11. Work of Fracture values for temper groups with 20 thermal shock cycles. All values are reported in Nm.

	Untempered	Sand-Tempered	Spanish Moss-Tempered
Mean	0.06507569849	0.06597796451	0.04524954435
Standard Error	0.0114168605	0.006457422226	0.0009814815408
Standard Dev.	0.022833721	0.01443923506	0.002194659444
Sample Variance	0.0005213788148	0.000208491509	0.000004816530075
Kurtosis	1.300064154	1.257359765	-1.597194618
Skewness	1.024639005	1.0509906	-0.2252516911
Range	0.05359579574	0.03724587288	0.00527250002
Minimum	0.04267883677	0.05145165407	0.04234328329
Maximum	0.09627463251	0.08869752695	0.04761578331
Count	4	5	5

For the briquettes that underwent 40 thermal shock cycles (Table 12), the results show the continued changes to ceramic strength after initial failure and prolonged thermal shock exposure. The sand-tempered briquettes had the highest work of fracture values at 0.05114367042Nm, followed by the Spanish Moss-tempered at 0.046663259Nm, and lastly the untempered

at 0.04391106924Nm. The minima and maxima values for all three temper groups lie fairly consistent to each other.

Table 12. Work of Fracture values for temper groups with 40 thermal shock cycles. All values are reported in Nm.

	Untempered	Sand-Tempered	Spanish Moss-Tempered
Mean	0.04391106924	0.05114367042	0.046663259
Standard Error	0.002458078054	0.006350508462	0.003735019
Standard Dev.	0.005496429622	0.01420016861	0.007470038
Sample Variance	0.00003021073859	0.0002016447886	5.58015E-05
Kurtosis	2.690799706	-2.250281936	-0.290006675
Skewness	1.554302405	0.3295105502	0.737051407
Range	0.01392381545	0.03268100034	0.017204671
Minimum	0.03917383162	0.0365387568	0.039208477
Maximum	0.05309764707	0.06921975714	0.056413148
Count	5	5	4

While sand-tempered does have the highest mean and maximum values, it also has the highest range, standard deviation, and sample variance which shows the greatest variability within the different sample sets. Additionally, the skewness and kurtosis values show that the data is distributed in a much different fashion than the untempered and Spanish Moss-tempered briquettes.

The work of fracture for the untempered briquettes decreases after 10 thermal shock cycles and increases after 20 thermal shock cycles, with the 20-cycle briquettes having the highest work of fracture for the untempered briquettes. Then the work of fracture decreases again after 40 cycles of thermal shock, with a similar work of fracture value to the 20-cycle briquettes. The sand-tempered briquettes had the greatest strength out of all the temper groups and followed a linear decline in their work of fracture as the number of thermal shock cycles increased. Finally, the Spanish Moss-tempered had the lowest mean work of fracture as well. The briquettes that underwent zero thermal shock cycles had a lower work of fracture than the briquettes exposed to 10 and 20 thermal shock cycles. The Spanish Moss-tempered briquettes that underwent 10 thermal shock cycles also had a higher work of fracture than those that underwent 20 cycles. The briquettes that underwent 40 cycles show a slight increase in the work of fracture, with a higher work of fracture than the briquettes that underwent no thermal shock exposure.

Similar to peak compression and modulus of rupture, the work of fracture data shows that the sand-tempered briquettes had the greatest

toughness and the Spanish Moss-tempered briquettes had the lowest toughness. Also, the work of fracture for the Spanish-moss tempered briquettes with no thermal shock exposure was nearly half of the sand-tempered briquettes with no thermal shock exposure. It should also be noted that the range for the work of fracture of the 20-cycle briquettes was roughly 0.005, which means there was very little variation across the 5 samples. Lastly, while the sand-tempered briquettes did see a gradual decrease in toughness as thermal shock cycles increased, the 0 and 10 thermal shock cycles sand-tempered briquettes had almost the same peak compressive value, with the average for each being a .002 Nm difference, having a significant decline after 20 and 40 thermal shock cycles.

DISCUSSION

The unexpected results from this experiment, specifically those that contrast with the findings of previous studies, require an analysis of possible reasons leading to the data collected. When comparing the performance of the quartz sand-tempered briquettes against untempered briquettes, other studies have noted that the addition of any tempers, including sand, leads to greater resistance to stress induced by thermal shock (Bronitsky and Hamer 1986; Bebber 2017; Kilikoglou et al. 1998; Skibo et al. 1989; West 1992). In addition, the thermally shocked briquettes were expected to demonstrate a loss of strength after completing all the assigned cycles which would have led them to have a weaker net strength than the briquettes that did not undergo any thermal shock cycles. Furthermore, it was hypothesized that the more thermal shock cycles a briquette underwent, regardless of temper type, the lower the net strength and thermal shock resistance would be.

The findings from the study partially support this hypothesis and showed that the results of the quartz sand-tempered briquettes significantly outperformed any of the untempered or Spanish Moss-tempered briquettes. When analyzing the strength of all of the quartz sand-tempered briquettes, none of the reported results are significantly different from the group, meaning that there was no outlier that could have possibly skewed the results.

When analyzing the Spanish Moss-tempered briquettes, the results showed significantly weaker values in their peak compression, modulus of rupture, and work of fracture than the untempered briquettes overall. This result does not align with the previous findings stating that the addition of a temper increases thermal shock resistance and overall net strength of a ceramic specimen (Bebber 2017; Bronitsky and Hamer 1986; Kilikoglou et al. 1998; Skibo et al. 1989; West 1992). Instead of a gradual decline in net strength, there was fluctuation among the groups assigned to a different number of cycles, showing that the Spanish Moss-tempered briquettes underwent 10 cycles had higher values of peak compression, modulus of rupture, and work of fracture. This suggests that the 10-cycle briquettes not only had greater net strength but also a longer lifespan after initial failure.

The results for the 20-cycle and 40-cycle Spanish Moss-tempered briquettes show higher values of modulus of rupture and work of fracture than the 0-cycle briquettes. Previous studies have shown that the strength of a specimen declines significantly after a single thermal shock cycle and does not significantly vary after 30 cycles (Li et al. 2014). The findings of this study contradict the findings of Li et al. (2014) by showing that there was not a significant loss of strength after the first thermal shock cycle. Further, the findings of this study contradict the findings of both Bronitsky and Hamer (1986) and Skibo et al. (1989) by showing that some of the briquettes exposed to thermal shock had greater strength than those that were not exposed.

A similar trend can be observed across all the temper groups. The expected result was for the briquettes to significantly lose strength after the first cycle of thermal shock, followed by a continual loss of strength as the cycles persisted, with the net strength beginning to plateau after 30-40 cycles (Li et al. 2014). The untempered briquettes were expected to have the greatest decline out of all three groups. Instead, the results for all three groups did not follow a linear decline of strength. The peak compressive strength fluctuates for both the untempered and sand-tempered briquettes, with a loss of strength from cycles zero to ten, but then shows greater strength after 20 cycles than the strength at 10 cycles. After 40 cycles, there was a decrease in strength again, showing an overall decrease from 0 to 40 cycles. Similarly, the peak compressive strength of the Spanish Moss-tempered after 10 cycles was greater than the strength after zero thermal shock cycles, and only slightly lower after 20 cycles. After 40 cycles, the peak compression value increases, showing a greater strength after thermal shock exposure. The same trend is shown for the modulus of rupture for each temper group. Overall, the sand tempered briquettes showed the greatest decline in peak compression, modulus of rupture, and work of fracture, which shows the greatest amount of strength loss. This contradicts the findings of Skibo et al. (1989), who state there was no significant strength reduction between the briquettes that underwent no thermal shock exposure and the briquettes that were thermally shocked. Further, the results of the Spanish Moss-tempered briquettes show an increase in peak compression, modulus of rupture, and work of fracture, suggesting an increase in net strength after thermal shock exposure.

The higher overall net strength of sand-tempered briquettes compared to the lower overall net strength of the Spanish Moss-tempered briquettes provides a possible explanation for the rise of sand as the dominant tempering material within the Southeast US. There is a clear benefit in using sand as a temper to increase thermal shock resistance, reduce thermal fatigue, and improve the overall toughness of the clay body, once fired. While the sand-temper results provide a clear understanding of temper benefits, the strength and toughness of the Spanish Moss-tempered briquettes raises questions on why it was chosen as a tempering material. The performance of the Spanish Moss-tempered briquettes was the weakest in peak compression, modulus

of rupture, and work of fracture, all being lower than the untempered briquettes. If the addition of Spanish Moss to the clay paste decreased their overall net strength, why was this temper used over untempered clay pastes? Other forms of ceramic performance, including workability, transportability, and stability, may account for the decision to use fiber-tempers within the production process. In fact, Bebber (2017) argues that adding tempers is beneficial to the production process because of the positive effects on workability. Further testing and analysis on other fibers (palmetto leaves, grass, etc.) as tempers may provide additional clarification to this question.

| A | B | C |

Figure 1. Imperfections in briquette morphology: A) Untempered briquette 1 with slightly warped edges on the bottom side; B) Quartz Sand-tempered briquette 1 with slightly warped edges on the bottom side; C) Untempered briquette 10 with a cavity within the body.

Outside of the data presented, looking at the briquettes themselves may provide clarity into a possible explanation. Morphological issues and the quality of a specimen's surface may also factor into the overall performance of the briquettes and can lead to unexpected failures (Danzer 2014). Danzer (2014) notes that bad or incomplete mechanical designs are a leading factor for unexpected ceramic failure, even over mechanical properties in some instances. Within the untempered groups, some briquettes did have slightly warped edges, shown in Figure 1a, on the bottom of the briquettes. This may have led to an unequal distribution of force on the briquettes during strength testing. However, briquettes with slightly warped edges did not perform significantly differently than those with straight edges. Furthermore, some briquettes with slightly warped edges performed better than those with straight edges. It should be noted that the quartz sand-tempered briquettes also displayed slightly warped edges, shown in Figure 1b, which still demonstrated a higher net strength than the untempered briquettes. The methods for further analysis on morphological defects impacting ceramic strength and potentially causing failure to provide little to no information, leading to difficulty when making improvements (Taylor 2004).

In addition, Danzer (2014) notes that hidden stresses can cause internal stresses that also account for a large number of unexpected failures in ceramic strength testing. While testing, it was observed that Untempered Briquette 10, which underwent thermal shock, did have a void in the body of the briquette (Figure 1c). While it did cause the crack to occur off-center

during the strength testing, the results remained consistent with that of the other five in the group. The peak compression and work of fracture remained close to the mean of the entire subset and the Modulus of Rupture was the second-highest value in the thermal-shocked untempered briquettes. This decreases the likelihood of the hidden void causing the strength of the untempered briquettes to be weaker than the quartz sand-tempered groups.

An analysis of the Spanish Moss-tempered briquettes is also necessary considering their completely unexpected results. When evaluating the data, each group, both the thermal shocked and non-thermal shocked, had similar value distributions. When also comparing the edges, there were no briquettes with any noticeably warped edges. Spanish Moss-Tempered Briquette 11, which underwent thermal shock, did crack off-center when undergoing strength testing; however, its peak compression aligned with the mean of the set, not causing any outlying factors. Furthermore, if the off-center crack did impact the results, it would have decreased the net strength, as it was on the lower end of the subset. Finally, the distribution of Spanish Moss within the mixture may have caused a difference in strength, but it is unlikely for that to have caused the unexpected results because all of the briquettes tested were made from the same batch of clay and temper, outside of Spanish Moss-Tempered Briquette 22. The composition used to create the tempers was mixed homogeneously before shaping and creating briquettes. To review this post-fire and post-experiment, I examined the Spanish Moss fiber casts left after burning out during firing. None of the casts visible show an unusually high or low amount of fiber cavities. Finally, all of the Spanish Moss-tempered briquettes tested were fired in the same test kiln together; therefore, the firing process should not have yielded a difference in performance.

While the results of this experiment provide new insights into the strength of both organic- and mineral-tempered briquettes, it should be noted that not all possible conditions were replicated, therefore providing results different than what previous potters would have experienced. For example, the use of electric hot plates kept the boiling water at a constant temperature and the ability to add more water in-between cycles if needed. Potters thousands of years ago would have relied on open flames or a controlled fire, which would result in shifting temperatures as the fuel source changed or outdoor elements interacted with the fire. Another heated element that could have followed closer replication was the method of initial firing. These briquettes were fired in a test kiln, with controlled heating, temperature, and time settings, whereas past potters likely used open-firing techniques with less control over their heating temperature. These factors, while not large enough to negate the results of this experiment, may have contributed to a different outcome than what the recovered pottery and ceramic fragments and sherd may have undergone. Future experiments and research projects that recreate even further possible conditions may help increase the accuracy

of these results.

To expand on the results of this experiment, there are several modifications and additions that could be made to improve the data and knowledge of the relationship between tempering materials and strength degradation over time. The total sample size included 60 briquettes, which allowed for 20 briquettes from each temper group. These 20 were evenly distributed into four groups of five, which were all assigned to either 0, 10, 20, or 40 cycles. The addition of a 30-cycle group could aid in understanding the changes in strength after every 10 cycles. Increasing the total sample size may help eliminate any potential outliers and provide better-averaged results for each temper and cycle group. Additional testing could also benefit this field of study by introducing information on other commonly identified tempers located within the Southeast, including sponge spicules, burnt and unburnt shells, and palmetto leaves. Each of these tempers has been a topic of study relating to Southeastern pottery and ceramics and may provide different results than the tempers tested in this experiment. While the results of this experiment led to unexpected results, continuing this study with a larger sample size and including additional organic fiber tempering agents and materials may provide a better understanding as to whether the data collected was due to error or if the expectations set by previous experiments should be altered due to the addition of new evidence. Finally, further research into the other primary technical decisions, including surface treatments, morphology, and firing temperature can contribute to the current understanding of ceramic thermal shock resistance. Even following similar methods to this experiment, changes to the thickness of the briquettes, surface treatment or pattern, and different firing temperatures and techniques and temperatures could produce different results.

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HEALTHCARE WORKERS' RESPONSES TO THE COVID-19 PANDEMIC:
A THEMATIC ANALYSIS

The coronavirus (COVID-19) was declared a pandemic by the World Health Organization (WHO) in March 2020 (WHO, 2020). This contagious respiratory illness resulted in many unprecedented challenges for healthcare workers (HCWs). The purpose of this paper is to conduct a thematic analysis of the literature on healthcare workers' responses to the coronavirus (COVID-19) pandemic. This paper will begin by describing the process of a literature review on the topic and the methodology employed to conduct a thematic analysis. Next, it will include an analysis of three qualitative research articles, titled "Healthcare providers experience of working during the COVID-19 pandemic: A qualitative study," "Nurse Reports of Stressful Situations During The COVID-19 Pandemic: Qualitative Analysis of Survey Responses," And "The lived experiences of nurses working during the COVID-19 pandemic." Other sources utilized include a non-fiction book titled *E.R. Nurses* by James Patterson and a National Geographic documentary titled *The First Wave*. From the analysis of these sources, five overarching themes and subthemes are identified, including anxiety, isolation, loss of workforce, mental illness, and a focus on coping strategies. Next, the implications of the findings are discussed. These implications represent considerations for HCWs and patients. These considerations include a need for organizational screening and intervention, the formation of an effective disaster management plan, and personal coping strategies. In addition, the discussion also considers impacts on patient outcomes and satisfaction. It concludes with a proposal of a potential research study that aims to explore the experiences of healthcare students during the COVID-19 pandemic and their readiness to enter the profession. Finally, the paper provides a conclusion to summarize the themes and proposed interventions.

BY LACEY SHOEMAKE

BACKGROUND

The COVID-19 pandemic resulted in unprecedented challenges for all HCWs. There is a

wide variety of HCWs included in this thematic analysis, a few of which include nurses, medical doctors, nurse practitioners, pharmacists, laboratory technicians, radiology technicians, and physician assistants. Despite the difference in professions, many of these HCWs experienced challenges such as limited personal protective equipment (PPE), visitor restrictions, and unknowns about the virus. The recent nature of the COVID-19 pandemic and its unknown implications for the field indicates a need to review the existing literature and focus on future research.

LITERATURE REVIEW

This thematic analysis utilized a literature review to assess the current state of research on the COVID-19 pandemic and healthcare workers. Because this pandemic is unprecedented and current, a limited amount of qualitative research addresses healthcare workers' overall experiences. More research is needed to adjust current understandings and interventions regarding this in the healthcare setting, and continued research is crucial to assess long-term impacts.

A literature search aided in selecting five data sources: three qualitative research articles, a non-fiction book, and a documentary. The first qualitative article, "Healthcare Providers' Experience of Working During The COVID-19 Pandemic: A Qualitative Study," utilized semi-structured interviews and a variety of healthcare workers to gather data. Three themes encompassed the findings: working in the pandemic era,' changes in personal life and enhanced negative affect, and gaining experience, normalization, and adaptation to the pandemic. The subsequent qualitative article, "Nurse

Reports of Stressful Situations During The COVID-19 Pandemic: Qualitative Analysis of Survey Responses," employed an open-ended survey to obtain responses. This article organized the findings into six themes: exposure/infection of self, illness/death of others, workplace, personal protective equipment/supplies, unknowns, and opinions/politics. The third qualitative article, "The Lived Experiences of Nurses Working During The COVID-19 Pandemic," utilized semi-structured interviews. This article assembled the findings into three themes: the human connection, the nursing burden, and coping. The non-fiction book, titled E.R. Nurses by James Patterson, was published in 2021 and compiled a collection of interviews with emergency room nurses. The National Geographic documentary, "*The First Wave*," was filmed during the first four months of the COVID-19 pandemic at a New York hospital and included subjective healthcare workers' testimonies.

METHODOLOGY

A thematic analysis was undertaken to analyze and synthesize the existing literature on healthcare workers' responses to the COVID-19 pandemic. This analysis utilized the methods outlined by Thomas and Harden (2008) to perform a thematic synthesis. First, using an inductive approach, relevant peer-reviewed articles were located through a literature search using the PubMed database and the keywords COVID-19, qualitative, and experiences until conceptual saturation. This analysis also included a non-fiction book and documentary to present a primary source of experiences.

After locating relevant sources, the text was coded line-by-line manually until descriptive themes were created. These themes included fear and threat to safety, isolation, loss of workforce, mental health, and focus on coping strategies. Next, analytical themes were recognized and included a threat to the safety of healthcare workers, loss of human touch and deep connection, a stigma around hospital workers, healthcare workers leaving the profession and short staffing, negative impacts on mental health, coping strategies, and personal ideals.

ANALYSIS OF FINDINGS

Five main themes were identified: Fear and Threat to Safety, Isolation, Loss of the Workforce, Mental Illness, and Focus on Coping Strategies. Each theme was further divided into subcategories to explore the findings thoroughly. These themes are prevalent in the literature and other sources included in this analysis and provide a comprehensive perspective of healthcare workers' responses to the COVID-19 pandemic. Understanding these experiences is crucial to aid in planning and intervention on an individual scale to a magnitude that encompasses healthcare organizations and government agencies.

Fear and Threat to Safety

Healthcare workers reported experiencing fear and a sense of threat to safety in the workplace during the COVID-19 pandemic. According to a study by the American Nurses Association (2020), nine out of ten nurses feared going to work. Fear of contracting the virus was expressed frequently throughout the analyzed literature. One HCW stated, "It's an awful feeling to wonder every single time I walk into a room with a patient. Is this it? Is this the time I'm gonna get sick and end up in the bed? Especially when the patient is a nurse" (National Geographic, 2021). The HCWs not only feared for their safety but experienced guilt and fear about spreading the virus to their family and friends. Many of them explained that their loved ones had multiple underlying conditions and risk factors for a potentially more harmful infection, including advancing age, respiratory conditions such as asthma, or a compromised immune system. One interviewee expressed, "We are coming in contact every day with our patients who may have it, and we may not even know it. Then we are going home to our families and potentially spreading it. I know that if I was the cause of a loved one of mine getting it I would never forgive myself for that" (National Geographic, 2021). This fear of spreading it to loved ones became a reality for some HCWs included in the literature analysis. Another HCW stated, "I brought COVID-19 home (I had the virus) and infected my husband. He ended up with bilateral pneumonia hospitalized. It is very stressful to think I could infect someone else as well" (Arnetz et al., 2020). This fear of contracting the virus and spreading it to others was in part due to issues surrounding PPE.

Factors surrounding PPE during this pandemic also contributed to experiences of a threat to safety. Many HCWs reported inadequate PPE in their workplace and stated management became very strict about conserving it. For example, many healthcare facilities required HCWs to wear the same N95 mask until it was visibly soiled or unusable. One nurse reported, "I had to break a strap on a mask to receive a new one (that I had worn for three 12-hour shifts and sneezed in it) and my place of work punished me for it" (Arnetz et al., 2020). HCWs wore a surgical mask or an N95 mask for the duration of their shift because of the PPE shortage and to reduce viral transmission. Wearing a mask for the entire shift contributed to prolonged mask-wearing during a work shift and further threatened safety despite PPE's protective function and necessity. Healthcare workers reported skin breakdown and blisters due to constant wear, and graphic pictures of these injuries circulated on social media and news channels. Others reported various physiological symptoms, with one HCW stating, "It's very difficult to wear N95 masks for twelve hours. I feel shortness of breath and will definitely have problems later" (Ardebili et al., 2021). These physical ramifications of prolonged use

of PPE have caused fear and physical harm.

Other experiences of HCWs included fear of "no end in sight" and a belief that the constant changes instituted during the COVID pandemic were the "new normal." Healthcare workers reported experiences of hopelessness and helplessness related to the constant unpredictability of policies and knowledge about the virus and the course of its influence. A healthcare provider expressed, "It's new, that is the worst thing in medicine. We are taught pattern recognition. Right now, there is no clear pattern" (National Geographic, 2021). Another HCW corroborated this experience by stating, "There's been a lot of unknowns, and learning as we go. The inconsistent information is hard to deal with" (Robinson & Stinson, 2021). These experiences of helplessness and hopelessness contributed to the fear of the "new normal" and "no end in sight."

Isolation

Healthcare workers also reported feeling isolated from others. Many HCWs were fearful of spreading the virus to others, as stated above. They took extreme measures to isolate themselves, including living in separate rooms or even homes from their families. One HCW reported, "I did not kiss my children and my husband from the beginning of this disease. My husband and I are sleeping in separate places" (Ardebili et al., 2021). In addition, many individuals decided to isolate themselves from HCWs due to a perceived risk of catching the virus. One nurse experienced that "people avoid me because I'm in scrubs" (Patterson, 2021). Not only was isolation reported in the personal lives of HCWs, but workers also felt it in the hospital setting.

In addition to societal and familial isolation, many HCWs experienced the immense pressure of being the only support person available for patients. During this time, many hospitals either restricted or did not allow visitors. These visitor restrictions were especially firm for patients diagnosed with COVID-19. Patients were often only able to communicate with their loved ones through video chatting, and HCWs were often a part of creating the opportunity for these virtual visits. One nurse reported, "You're the only one there while their family is on video chat and they are crying because they can't hold their hands" (National Geographic, 2021). For many, it was challenging to witness the isolation experienced by these patients. However, for many HCWs, this isolation was even more pronounced and difficult to endure when the patient was dying alone. One HCW expressed, "The patients are dying and they will not let their family members come. They are dying alone. They are dying with strangers" (Robinson & Stinson, 2021). This sentiment was reflected many times by other HCWs. Another stated, "The absolute worst part is watching these patients die and there is no one; their families do not get to come see them. The staff is dressed from head to

toe, there is no skin to skin, there is nothing. These people are dying with no one to touch them, no one that loves them around" (Ardebili et al., 2021). This feeling of loss of human touch and deep connection due to personal protective equipment and measures to limit exposure was also expressed frequently in the literature.

Healthcare workers, at a minimum, generally wore scrub caps, protective eyewear, N95 masks, gowns, gloves, and shoe protectors as protection when entering a COVID-positive room. In addition, HCWs usually only spent the minimum time providing care and did not spend extended time in patient rooms to decrease exposure time. A nurse reported, "Comfort is hard to give when the patient cannot see your face. They cannot hear what you are saying. Your face is covered. It's like you are allergic to them or something. Or not coming in as often as we normally do to minimize exposure. They're really, really sick and they are scared. I cannot imagine how that is to feel like you are alone" (Robinson & Stinson, 2021). These experiences of isolation in the hospital setting contributed to the challenging nature of the pandemic.

Loss of Workforce

Another experience reported was a loss of the healthcare workforce. Many HCWs left their respective healthcare profession because of the unprecedented challenges brought about by the COVID-19 pandemic. According to a poll conducted by the Washington Post and Kaiser Foundation (2021), roughly 3 in 10 healthcare workers have considered leaving the profession.

A nurse stated, "After this, I have to leave for a while so that I can return to this job. I have to be very far from the hospital, illness, and death" (Ardebili et al., 2021). This decreased workforce created higher patient loads for HCWs, which led to unsafe assignments for many workers. In attempts to compensate for these assignments, many HCWs reported working extra hours. One nurse reported that she was often required to work 48-72 hours per week (Patterson, 2021). These impacts on the workforce may significantly impact the healthcare field even in the future. One nurse expressed, "Imagine the new nurses, I would be terrified, I would probably quit" (Patterson, 2021). The loss of workforce theme is crucial to understand to retain HCWs.

Mental Health

Many HCWs also experienced negative impacts on their mental health. These mental health changes included experiencing signs and diagnoses of depression, anxiety, post-traumatic stress disorder (PTSD), and other mental health conditions. The fifth edition of the Diagnostic Statistical Manual (DSM-5) outlines parameters for diagnosing major depressive disorder that include the experience of one or more major depressive episodes (American Psychiatric Association, 2013). One HCW reported, "I'm still

not feeling well and I feel very sad" (Ardebili et al., 2021). Another stated, "People were breaking down at work, you know, nurses would go to the breakroom, they'd cry for a few minutes, and go back to work" (Robinson & Stinson, 2021). Healthcare workers recounted similar experiences throughout the literature. Quantitative research also supported these findings. According to a survey of 605 HCWs, approximately 14% of HCWs reported experiencing depression (Van Wert et al., 2022). The same study found that 43% of HCWs experienced mild or higher anxiety. Concurrent with this quantitative data, HCWs reported experiencing generalized anxiety disorder (GAD) and panic disorder symptoms. Parameters for this mental illness include prolonged and frequent worry (American Psychiatric Association, 2013). Healthcare workers reported experiencing this worry during every shift and even outside of work. One healthcare worker reported, "The stress was overwhelming for some" (Robinson & Stinson, 2021). Healthcare workers also reported experiencing panic attacks, some of which occurred during the work shift. A panic attack is an intense sensation of anxiety that often comes with distressing physical manifestations, including shortness of breath and a feeling of impending death (American Psychiatric Association, 2013). One HCW reported experiencing these symptoms and expressed, "I had chest pain. I had a headache" (Robinson & Stinson, 2021). There is a possibility that more experiences of these symptoms and diagnoses will appear due to the recent nature of the pandemic.

In addition to depression and anxiety, PTSD was a mental illness that HCWs reported. According to the American Psychiatric Association (2013), a diagnosis of PTSD requires the experience of a traumatic event and difficulty coping with that event. Some HCWs described the effects of the pandemic as traumatizing, including the higher mortality of patients, elevated levels of stress and fear, and feelings of isolation. Many HCWs reported being diagnosed with PTSD from working during COVID-19, and the study mentioned earlier by Van Wert et al. (2022) found that about 22% of HCWs experienced symptoms of PTSD. One frequently reported manifestation was recurrent nightmares related to the trauma of working in a hospital during the COVID-19 pandemic. These nightmares often led to insomnia. Similar to depression and anxiety, the diagnosis of more cases of PTSD may appear as the full effects of the pandemic appear.

Coping Strategies

While there have been many negative impacts due to the COVID-19 pandemic, it is also crucial to explore a positive outcome. Healthcare workers have reported recognizing the importance of developing coping strategies to get through this time and the importance of utilizing them in the future.

Healthcare workers reported various coping strategies such as hobbies, relationships with others, spirituality, and healthy habits. Even

among these specific types of coping strategies, there is a wide variation in what is effective for each individual. Healthcare workers reported new hobbies acquired to cope during the pandemic that included activities such as gardening. One HCW reported, "I make a garden. We're doing projects around the house. That's actually helped my anxiety level. I like when projects get done. It makes me happy" (Robinson & Stinson, 2021). In addition, many HCWs found resilience through relationships with others. These relationships included romantic partners, coworkers, friends, family, and pets. For example, a nurse stated, "I started reaching out to my coworkers. I would call them and see how they are doing" (Robinson & Stinson, 2021). Another HCW expressed, "We got each other, we will get through this" (Robinson & Stinson, 2021). The importance of relying on coworkers and developing a deeper bond during the COVID-19 pandemic to cope was reported multiple times throughout the literature. Another HCW reported confiding in their significant other during the difficult times of the pandemic. She stated, "My husband's been really good, just trying to talk about it even though he does not quite grasp everything that is going on, but he's been very good about talking everything through" (Robinson & Stinson, 2021). These relationships outside of work, including family, friends, romantic partners, and pets, were reported to help with personal coping.

Another coping strategy reported by HCWs was religion. Many HCWs found strength in prayer, whether alone or with others. One nurse expressed, "My colleagues and I pray a lot together. It has made me rely on God" (Robinson & Stinson, 2021). This faith allowed many HCWs to find meaning and strength.

The institution of healthy habits was another positive coping strategy reported by HCWs. These healthy habits included spending more time outside and physical activity. One HCW shared, "I am focusing on getting sleep and on my days off exercise. I go walk in the park" (Robinson & Stinson, 2021). Another expressed, "I've been walking my dog a lot more" (Robinson & Stinson, 2021). These healthy habits enabled many HCWs to cope and promote physical health and well-being.

In addition to traditional coping strategies, many workers were able to cope by finding strength in personal ideas about what it means to be a HCW. Many HCWs felt the challenges of the COVID-19 pandemic spoke to the importance of their profession. A medical doctor expressed, "We have to follow the medical oath we took. Based on that oath, it is our duty to be at work now" (Robinson & Stinson, 2021). A nurse shared, "When we came into this profession, we prepared ourselves that we might even lose our lives. This is the sacrifice that a nurse makes" (Ardebili et al., 2021). Another nurse stated, "These kinds of things really dig into the spirit of nursing"

(Robinson & Stinson, 2021). This sense of duty enabled many HCWs to find meaning in working during the COVID-19 pandemic and helped many HCWs to cope. Many HCWs felt pride in fulfilling this perceived duty. A nurse expressed, "I've never been so proud to be a nurse. I feel like this has been an accomplishment" (Robinson & Stinson, 2021). This sense of pride also contributed to finding purpose during the COVID-19 pandemic.

DISCUSSION

These findings introduced many implications for HCWs and patients. Screening and intervention of COVID-19-related negative impacts and the development of coping strategies are necessary for HCWs. The findings have also shown some effects of the COVID-19 pandemic on patient outcomes and satisfaction.

What It Means For Healthcare Workers

Identification of the challenges faced by HCWs and mental health implications can inform future screening and intervention by healthcare agencies and organizations. Screening for mental health consequences, such as depression, anxiety, and PTSD, is indicated. Healthcare workers in leadership positions can establish relationships and communication with staff to detect changes in their mental health. These relationships can also encourage HCWs to report changes in mental health to their workplace. Creating a workplace culture that does not stigmatize mental illness is also crucial to promoting reporting of symptoms. Additionally, the administration of simple, standardized screening tools for HCWs can screen for declining mental health. If a deterioration in mental health is suspected, leadership must provide referrals to resources such as counseling.

In addition, much of the reported fear and threat to safety was because of a lack of PPE. Strict visitor guidelines also contributed to a sense of isolation for HCWs. These conditions, as well as short staffing and higher ratios, resulted in HCWs leaving the profession. Healthcare agencies and organizations can benefit from creating a more effective preparedness plan. The lack of PPE and supplies experienced during this pandemic demonstrates the need to ensure an adequate stored supply to prepare for a possible future emergency. In addition, while HCWs worked creatively to allow patient and visitor contact through virtual means, the findings of isolation despite this demonstrate a necessity for creating more innovative ways to enable patients to feel closer to visitors and less isolated. Finally, creating more optimal work conditions is crucial to retain staff and prevent HCWs from leaving the profession. Preparing supplies for disasters is essential, but investing in staff by preparing and training them for disaster situations can promote a safer and more manageable work environment. In addition, providing a healthy hospital culture and a sense of support is crucial to maintaining

staff. A healthy culture includes an environment conducive to learning and respectful interdisciplinary communication. A sense of support should be conveyed through meaningful actions and compensation and establishing a safe environment to practice.

Healthcare workers can also adapt to the pandemic on an individual level. These workers can prepare through the development of personalized coping strategies. Many HCWs found that these strategies enabled them to deal with the negative impacts of the pandemic and extreme workplace stress. Creating these strategies requires personal reflection into what is effective for them personally and can involve trying new activities. Examples prevalent in the literature included dog walking, prayer, and relationships with others.

What It Means For Patients

Healthcare workers' job satisfaction and general well-being can significantly impact patient satisfaction and outcomes. A study by the American Nurses Association (2017) found that a 25% increase in nurse job satisfaction over two years was linked to increasing the overall quality of patient care up to 20%. This data demonstrates that patients receive better care when HCWs are satisfied with safe and healthy work environments. Not only is care more effective, but HCWs can spend more time with patients when HCW to patient ratios are more manageable. This time spent can result in patients feeling more satisfied.

In addition, managing isolation is an essential consideration for patients as well. Many HCWs reported that patients were dying alone and without anyone they knew. As discussed previously, the necessity to create new innovative ways to decrease patient isolation and promote visitor contact and communication is indicated.

Future Research Proposal

The findings and considerations of this thematic analysis indicate a further need for research in the area of experiences related to COVID-19. While HCWs have been significantly impacted by the COVID-19 pandemic, students of healthcare disciplines during this time have also experienced unprecedented challenges. One of these difficulties included virtual education in a highly hands-on field. Instead of utilizing a simulation or skills lab with semi-realistic practice mannequins and supplies, many students completed skill learning and practice on computer software. In addition, there was frequently limited clinical experience in hospitals and other healthcare facilities. The impacts this lack of experience will have on healthcare students' perceived quality of education and skills during the COVID-19 pandemic should be researched further. These experiences might impact readiness to finish a healthcare degree or enter the profession after graduation. In addition, the literature on COVID-19 has already demonstrated a loss of the workforce. There is also limited existing research on students'

experiences of the COVID-19 pandemic. These issues further establish a need to research this topic.

CONCLUSION

The findings of this thematic analysis establish a variety of negative impacts experienced by HCWs during the COVID-19 pandemic. Despite this, there are actions by healthcare organizations, healthcare agencies, and individual HCWs that can promote a safer and more positive work environment, develop coping strategies, and ensure greater patient satisfaction and outcomes. The findings from this thematic analysis also indicate a need for further research on the experiences of healthcare students and their readiness to enter the profession during and after the COVID-19 pandemic.

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A PURPLE BRIDGE:
THE PATH OF A SCREENWRITER

When "we", professional and nonprofessional screenwriters, in an audience, experience the viewing of a Video Home System (VHS) film, they must know why screenwriters deserve better recognition or suffer not realizing their significance. Standing in their way, are their favoritism towards a film's visual aspects and maintaining their attention and interests. To be convinced and enlightened they must, first, understand its basics, screenplay process, script development, influence upon the film industry, and observe a sampled screenplay being rewritten. Thus, the title of this film is, "A Purple Bridge: The Path of a Screenwriter".

TREATMENT

Filmmaking requires contribution and collaboration from a multitude of people. Its departments focus on logistical concerns, technical details, visual components, and creative development. Of course, not all are known to the general audience, but the actors/actresses, director, and producer are the most recognized. Likewise, the common praises of a film are its direction, editing, and acting. This is not the same for writing. Although original and adaptive screenplays are awarded from the Oscars and Writers Guild of America, its practice receives lesser recognition. Screenwriting considers the technical and creative aspects of a film, but it also expects to consider the narrative, character(s), and conflicts or its writings. For this reason, I expect to offer a verbal and visual confirmation of the basics of screenwriting, the process of a screenplay, the department of script development, and a screenwriter's influence upon the film industry. As a result, this thesis will answer as to "why" screenwriter's influence screenwriters deserve better recognition. In fact, it will not only be intended to answer one's questions about the profession but to acknowledge and encourage professional and aspiring screenwriters. "A Purple Bridge: The Path of a Screenwriter", will be

an expository documentary that will touch on the elements of screenwriting.

AUTHOR'S DRAFT
I. Prologue
    a. "Hook"
        i. Shows *Get Out* (2018) getting awarded for best original screenplay.
        ii. Mentions its most iconic scene of the film, the "Hypnosis Scene"
        iii. Compares its praises for their writing to its stars (actors/actresses), production, and visual direction.
    b. Main Problem: Screenwriters do not receive enough recognition.
    c. Main Goal: To answer, "why screenwriters deserve better recognition"? d. Hopes:
        i. To answer one's questions about screenwriting.
        ii. To encourage professional and aspiring screenwriters.
    e. Introduction to main segments
II. Part 01: The Basics
    a. Brief History
        01. Golden Studio Era (1920s-1940s)
        02. Paramount Decision of 1948 (1947-1967)
        03. Merging Buyouts (1980s-1990s)
        04. "New Spec Format" (1990s-Current)
III. Part 02: Screenplay Process
    a. Adaptive Screenplay
        01. Adapted Platforms
        02. Kinds of Adaptations
        03. Remake, Reimagine, Reboot
    b. Original Screenplay

IX. FIN
    a. Credits (staff, sources, etc.)
    b. Special Thanks

Cast and Crew:
India Standley (Producer, Writer-director, Sound Editor)

Locations:
University Suites Dormitory and Study Room (used for narration recordings)

Key Equipment:
iPhone 10 mini (used for narration recordings)
Adobe Software (Premiere - Film/Video Editing, Audition - Audio Editing,
Voice Memos - Voice Recordings)
Light stands

List of Needed Visual Effects:
- Inspired by the feel of a VHS film {Goal}
- Inspired by the Vapor-wave Aesthetic (sources: Pinterest, Aesthetic Wiki)
- Time Period Inspiration: 70s-90s era
- Meant to provide a nostalgic feeling {Goal}
- Offers a static texture that replicates a VHS film
- Contains text/typography with a vintage or nostalgic font
- Color Palette: Mostly purple with hints of pink and blue (can be neon)

List of Needed Sound Effects:
- Inspired by the sounds of a VHS film {Goal}
- A tape inserted to a cassette player
- A tape ejected from a cassette player
- A tape in fast-forward and rewind
- A tape being paused
- The static texture of a VHS film {Goal}
- Applying a subtle static texture upon the narration and intermission vocals

List of Needed Music:
- "Shopping Theme" {Wii Shop Channel}
- "Theme Shop" {Nintendo 3DS}
- "Puzzle" {Photo Channel}
- "Mii Maker" {Nintendo 3DS}
- "Internet Settings" {Nintendo 3DS}
- "Mii Maker" {Wii U}
- "E-shop Menu" {Wii U}

List of Needed Texts/Typography:
- Main Goal:

- - Why Screenwriters Deserve Better Recognition?
- Hope:
  - Answer One's Questions About Screenwriting
  - Encourage Professional and Aspiring Screenwriters
- Part 01: The Basics
  - Brief History
    - Golden Studio Era (1920s-1940s)
      - Writers were not paid by studios
      - Were not expecting ownership
      - Were given authorship from the Paramount Decision of 1948
    - Paramount Decision of 1948 (1947-1967)
      - Effected a screenwriter's freedom
      - Screenwriters because freelancers and independent employees
    - Merging/Buyouts (1980s-1990s)
      - Hollywood institutions shifted strategic and creative priorities which affected screenwriters
    - "New Spec Format" (1990s- Current)
      - Introduced technology and screenwriting software
      - Impacted the current screenplay format
        - Leaner, dynamically reader friendly, efficiently commercial
- Part 02: Screenplay Process
  - Adapted Screenplays
    - Adapted Platforms
    - Children's Books
    - Graphic Novels/Comic Books
    - Short Story
    - Novel/Novella
    - Non-Fiction/Journalism
    - Biography/Memoir
    - Stage Play
  - Kinds of Adaptations
    - Prestige
      - An adaptation that is faithful to the source
    - Straight
      - A faithful adaptation of a popular or obscure source
    - Reimagined

- - - A screenplay that is less faithful to the source
  - Remake
    - Uses an earlier production as the underlying work
  - Reimagine
    - Uses the original film as inspiration
  - Reboot
    - A film that is more about the franchise
- Original Screenplay
  - Brainstorming
    - What If…
    - Cards, Outlines, Journals, and Boxes
    - Good Screenplay =
      - The writer's "voice" is heard
      - Expands the writer and viewer's look on life
  - Research
    - To make a story plausible and realistic
    - To make the script cinematic
  - Structure
    - Must be determined first
    - Choice of linear or non-linear structures
    - Story Driven
      - Relies on the plot
    - Character Driven
      - Relies on the character
  - Story Spine
    - Spine: connects the character, theme, and action
    - What is the story about? What happens to the protagonist?
  - Story Shape
    - Each character(s) has their own scene
    - One character = linear
    - Multiple characters = shape
    - Examples: Romance, Sports, Crime, Horror, and War Films
  - Limitations
    - Factors
      - Availability of the Actor
      - Weather Changes
      - Availability of Equipment/Crew
      - Delivery Deadlines

- Financial Resources
  - Has significant influence
  - Considers the characters, locations, props, time, crew, and equipment
- Format
  - General Principles
    - 1 paged script = one minute of a film
    - 120 page script = 2 hour film length
    - Twelve-point Courier font
    - Written in present tense
    - Words = scene, action, image, character, and events
  - Scene Heading
    - Introduces each and every scene
    - Scene: a moment that combines time and location
    - Benefits shot lists and shooting schedules
  - Stage Directions
    - Contains most of the screenwriting
    - Contains character actions, settings, images, and all non-dialogue sounds
    - Is written in past tense
    - Character Introductions
      - Must be capitalized.
      - The character(s)'s names will be normal for the rest
      - Indicates the amount of characters for the Producer and Casting Agent.
      - Allows the actors to find their first scene
    - Sound Cues
      - Non-created sounds from a character must be capitalized
      - Indicates what sounds to find/ create for the Sound Designer
    - Readable Text
      - Text that's meant to be read by the audience
      - Is in quotation marks
      - Alerts the Director and

Cinematographer
- Character Cues
    - Indicates which character speaks
    - Must have a consistent name
    - Off Screen: a character present in the time and place of the screen
    - Voice Over: implies a person speaking from the perspective of memory
- Personal Directions
    - Refers to a person talking
    - Capitalized unless proper nouns are within it
    - In parentheses
    - Small, important actions that must happen
    - One receives dialogue from group scenes
- Rewriting
    - A script must be reshaped before production
    - Considers technical errors, grammar/format adjustments, budget considerations, and narrative adjustments
- Selling the Screenplay
    - Outcomes of Selling a Screenplay:
        - Script's quality
        - The Market
    - Selling the Script = Selling the material and/or getting hired to work on separate screenplays
    - Selling never ends
    - How a Screenwriter Finds Representation:
        - Conferences
        - Screenwriting Contests
        - Industry Players
        - Screenplay Sites
    - Pitching
        - An oral presentation that presents ideas to the producer, director, and buyer.
        - Do not expect to sell your script right away!
        - It's about having the buyer and investor wanting more
        - Good Pitch = Vivid + Brief + Memorable

- Part 03: Script Development
  - Working and/or reworking a film's story material, adding, cutting, or refining details
  - Script Development = Social + Cultural + Creative
    - Social (Communication)
    - Cultural (Collaboration)
    - Creative (Creating a story)
  - Roles
    - Screenwriter: writes the scripts for film and television
    - Script Consultant: offers guidance to the early revisions of the author's draft
    - Script Editor: offers feedback for the sake of the story and film production
    - Story Editor: edits storylines for logic and continuity
    - Storyline Writer: brainstorms ideas for the concept and treatment of the screenplay
  - Stages
    - Concept: an outline of the basic elements in a story
      - Identifies the main character, conflict, and the resolution
      - Good concept = Outlines the narrative shape
    - Treatment: describes the plot
      - Written in present tense
      - Written before the actual screenplay
      - Moves the story forward
    - Author's Draft: a completed version of the narrative
      - Prioritizes the story, character development, conflicts, actions, settings, and dialogue
      - Revised until approved by the producers, production companies, and/or funding agencies
      - Leads to the final draft of the screenplay
  - Intellectual Property
    - A book, screenplay, article, life story rights, video game, webisode, or other form of written expression - Joel Goller {CEO of Intellectual Property Group}
    - Copyright: a screenwriter's write to own property and prevents others from copying it
      - Progress Clause: Congress's ability to control intellectual property.

- - - The Constitution has no copyright clause
    - Resulted from the Copyright Act in 1790
  - Rights of the Copyright Owner
    - Copying the screenplay
    - Selling or licensing the screenplay
    - Horizontal integration (branched platforms)
  - A writer gets copyright once a screenplay is made
    - No need for publication or registration
  - Non-written ideas and work are not protected by copyright (ex: oral pitches)
  - A writer's copyright last throughout their life plus 70 years
- Writers Guild of America: proves a script's existence
  - Requirements:
    - An additional copy of the screenplay (hardcopy or digital)
    - Paying a nominal registration fee
  - The copy is deposited to the vault for 5 years (+) another 5 years
  - Does suggest leaving work for too long
  - Leaving behind a script = maintaining contact + wanting to know about the script
- Lawyer, Agent, Manger
  - Lawyer: consults on a negotiating strategy, reviews contracts, deals with the opposing lawyer
  - Manager: involved in dealmaking, planning, facilitating, and building
  - Agent: involved with negotiation
- Part 04: Screenwriting and the Film Industry
  - Previsualization
    - A visual strategy for the film before production
    - Shooting Script: a version of a screenplay that is taken to production
      - Allows the director to see every scene in the film

- Revisions should be done before coverage
- Benefits the Cinematographer, Art Director, Sound Mixer,etc.
  - Overhead Diagram: illustrates each scene
    - Determines axis of action, camera placement, and character blocking
  - Storyboards: illustrates shots within its sequence
    - Drawn in the same aspect ratio as the camera frame
    - The text indicates the shot description, actions, and dialogue
- Outcomes
  - Producer
    - One or more writers will be employed if an idea is not yet written.
    - What if something goes wrong?
      - The original writer can be replaced with a new one
      - The second writer must respect the original one
  - Director
    - A script MUST attract the director!
    - Must attract their experiences and add volume to their "voice"
    - Characters must be capable of empathized and learned from
    - A director can choose to collaborate with a screenwriter as the co-writer or for better clarity
  - Actors and Editors
    - "You don't just deliver the line. You think about it. You dream about it. You connect with it in very personal ways. If you're successful, you have something to bring to the party." - Leonard Nimoy
    - "My job is to enhance the writing and to make sure that everything is clear in the final version…I think that writing and editing are very closely related. Both are more monastic than social." - Littllton {Editor}
  - You and Your Work Matters!

- ● Thank You!
- ● FIN
  - ● Credits (staff, sources, etc.)
  - ● Special Thanks to….

Mood and Tone:

Vaporwave Aesthetic Inspiration

      Resembles the 70s - 90s, gives the sense of nostalgia
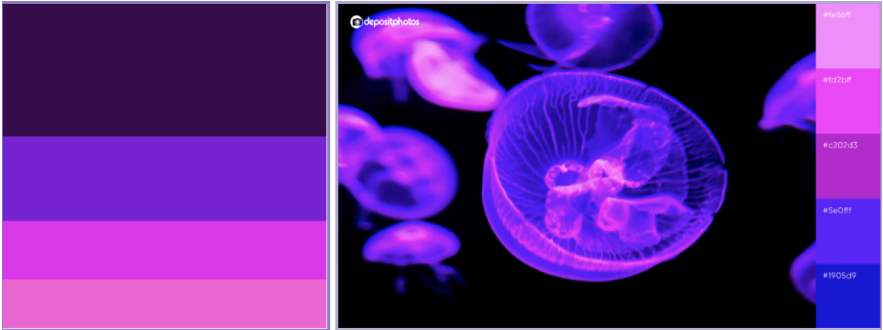
Video Home System (VHS)

      Mimics 70s - 90s film/television tapes, contains sound effects (SFX) and visual effects (VFX) that   replicates   the tone, contains music that compliments the aesthetic

Color Palette:

Main Color: Purple (Neon)
Inspired by the Screenplay's Title
Sub-colors: pinks and blues (Neon)

Viewing Reference:

KAWAII PARADISE - Supermega JAPAN VLOG #1 (1:38-1:56)

    A VHS inspired montage.
    Provides information with text.
    Contains bold, colorful visuals in the background.
    Has vintage-styled music.
    Replicates the texture of VHS footage.

Poppy Playtime All Secrets Vhs (1:03 - 2:10)

    Is a VHS inspired montage.
    Contains SFX of the tape being put into the VHS.
    Has striking visuals in the background.
    Provides information through text and visuals.
    Is interactive with the audience.

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FRIEDRICH NIETZSCHE AND THE PROBLEM OF EGO

I n *Beyond Good and Evil*, Nietzsche introduces his concept of self-overcoming. Self-overcoming entails a rejection of a unified self; in other words, there is no human nature, and there is no singular "self." In outlining this concept, Nietzsche criticizes two opposing schools of thought: institutional religion and authoritative science. By claiming human nature—either God-given or evolved—we can absolve ourselves or our Gods from any responsibility for our actions. By criticizing both sides of the main philosophical discourse, Nietzsche cements himself as an incredibly important and controversial figure. Thus, there is much work already regarding Nietzsche's self-overcoming. However, most of this research is largely focused on the work that contains it: *Beyond Good and Evil*. For example, in his article "Nietzschean Self-Overcoming," Jonathan Mitchell attempts to outline self-overcoming as its own distinctive ethical framework o, a "re-evaluative ethical activity" (Mitchell 324). Mitchell's work involves a kind of quantification of self-overcoming by identifying its evaluative framework. Another scholar, Andre van der Braak, connects self-overcoming with Zen Buddhism to further explain his interpretation of Nietzsche's perspective. This project takes a different approach by connecting the concept of self-overcoming to Nietzsche's earlier work, *The Birth of Tragedy*. While *The Birth of Tragedy* vastly differs from *Beyond Good and Evil* in terms of style and content, reading them together offers an explanation of how Nietzsche's perspective on the ego evolved throughout his work. In Part One, I will provide a close reading of *The Birth of Tragedy* that both explains Nietzsche's main goal for the text and outlines the most notable themes. I will then argue that threads of ego-destruction are already present in *The Birth of Tragedy* by scrutinizing Nietzsche's references to Sophocles' *Oedipus* trilogy. In Part Two, I will introduce relevant passages from *Beyond Good and Evil* and provide an interpretation that relates this

work to themes from *The Birth of Tragedy*. I will explain Nietzsche's *Übermensch* as it relates to self-overcoming and argue that the *Übermensch* closely relates to the Dionysian tragic hero present in *The Birth of Tragedy*. Then, I will discuss how Nietzsche's concept of "consolation" gained by viewing tragedy sets up his later existentialist framework by providing an early picture of self-creation.

LITERATURE REVIEW

In Beyond Good and Evil, Nietzsche suggests that a philosophy of the future might find the destruction of man desirable (*Beyond Good and Evil*, 153). This is part of a larger assertion that the desire to abolish suffering is foolish; for Nietzsche, this kind of self-destruction is valuable because it makes us stronger (*BGE* 154). While Nietzsche refers to suffering in general in this passage, this sentiment is closely tied to his concept of self-overcoming. There are several varied interpretations of this concept and how it should be addressed within philosophy. Much of the existing work discusses Nietzsche's self-overcoming in terms of his arguments regarding the will to power found in *Beyond Good and Evil*. While there is much discussion of self-overcoming and suffering, there is not much existing work that connects self-overcoming to tragedy specifically. This literature review is meant to both establish some current points of view on self-overcoming and call attention to gaps in the current field of scholarship surrounding Nietzsche's fascination with tragedy in conjunction with self-overcoming.

Andre van der Braak's "Zen and Zarathustra: Self Overcoming without a Self" attempts to defend a reading of self-overcoming that parallels certain aspects of Zen Buddhism. This seems to be a fairly unique take, but it does speak of self-overcoming in terms of the will to power. Van der Braak seems to agree with the more established takes on the will to power but

differs from the field on his interpretation of self-overcoming. Van der Braak discusses Nietzsche's view of life as the will to power and asserts that the will to power "continually overcomes itself" (8). Earlier in the paper, van der Braak examines the first speech of part I of Thus Spoke Zarathustra. Here, van der Braak retells the story of the camel that transforms into a lion, who then must learn that "both 'I' and 'will' are illusory notions. The autonomous self with a sovereign free will is a fiction" (6). This seems to align with Nietzsche's views, as demonstrated in Section 19 of *Beyond Good and Evil*. In this section, Nietzsche explores the concept of "will," which he says is much more pluralistic than most people assume:

> But now let us notice what is strangest about the will—this manifold thing for which the people have only one word: inasmuch as in the given circumstances we are at the same time the commanding and the obeying parties [...] we are accustomed to disregard this duality, and to deceive ourselves about it by means of the synthetic concept "I," a whole series of erroneous conclusions, and consequently of false evaluations of the will itself, has become attached to the act of willing-to such a degree that he who wills believes sincerely that willing suffices for action. (26)

I read this to be a simultaneous rejection of the "I" and the established concept of the "will." To clarify, I believe that Nietzsche rejects the commonly accepted meaning of will, not the existence of will itself. In rejecting this idea of will as a singular cause-and-effect (or perhaps intent and action), Nietzsche also rejects the "I," or the self. Nietzsche uses the example of a governing class identifying with the successes of its commonwealth (*BGE* 26-27), which seems to imply the idea that the concept of "I" was synthesized to act as a shortcut in describing "a social structure composed of many 'souls'" (*BGE* 27). In other words, the concept of the "I will" is comparable to a government taking pleasure in the successes of its constituents in that it is simplifying a series of actions that are incredibly variant and numerous.

However, van der Braak's interpretation seems to diverge when he refers to self-overcoming as "a process of individual self-enhancement" (8). The use of "enhancement" is a misleading term because it entails some implications that could contradict the rejection of the "I." While we have already established that Nietzsche sees suffering as a way to grow stronger, I doubt that he would refer to this process as "self-improvement" or anything remotely similar to this terminology. The term "self-enhancement"—by its use of "self" as a prefix—does not work for precisely the reason that "self-

overcoming" does work. Using "self-enhancement" implies that there is a self to improve. Conversely, self-overcoming tells us that there is a self to overcome. In clearer terms, if we aim for self-enhancement, we aspire towards a "better self," or a self that is better than my current self. If we aim for self-overcoming, we aim to reject the very notion of self. As I read it to be, Nietzschean self-overcoming does not entail an improvement of a current self, but rather that we rise above thinking of ourselves in terms of a singular self or a self with any consistency. Of course, van der Braak could be using self-enhancement with all this in mind, but there is no way for the reader to know; he uses the term once and does not expand upon what he might mean. Van der Braak's paper seems inconsistent because it both aligns with Nietzsche's ideas and makes use of terminology he would despise.

On the other end of the spectrum is Jonathan Mitchell's "Nietzschean Self-Overcoming." Mitchell wants to diverge from the traditional tendency to frame self-overcoming predominantly in terms of the will to power; instead, he sets out to outline self-overcoming as a "distinctive kind of re-evaluative ethical activity" (326). Mitchell's project is to establish or identify some kind of self-evaluative framework within Nietzsche's ideas. He is mainly focused on identifying the "ethics" of Nietzschean self-overcoming, partially as an addition to the generally accepted concept of self-overcoming in relation to the will to power. He sets up what he sees as the content of a self-evaluative framework to later explain how Nietzschean self-overcoming is a rejection of that (328). Mitchell's reading of self-overcoming differs from "the perpetual pursuit of overcoming resistance" (329). Mitchell wants to rethink self-overcoming not as a change in opinion but as a change in the normative standards that we use to make evaluations in the first place. He gives an example of someone who "achieves self-overcoming [by] abandoning her faith" because her concept of herself is destabilized, and she rejects the religious norms she previously followed (331). It is with this example that my main critique of Mitchell's interpretation lies.

While I agree that Nietzsche's conception of self-overcoming does involve some abandonment of the normative frameworks in place, Mitchell's example seems to be in favor of simply replacing that framework with a different one. Along with this, he wants to describe self-overcoming as a kind of ethical activity that we can take part in, which seems akin to van der Braak's idea of self-overcoming as a kind of self-improvement. Mitchell's example of the newly turned atheist seems to illustrate a fundamental misunderstanding of Nietzsche's project in *Beyond Good and Evil*. To operate under a system of ethics is one of the many prejudices of philosophers that Nietzsche outlines in part one. In his discussions on free will, he remarks that many refuse to consider the possibility of an 'unfreedom' of will for two reasons. For one, it would require them to "give up their 'responsibility,'

their belief in themselves, the personal right to their merits at any price" (*BGE* 29). On the other hand, others "do not wish to be answerable for anything or blamed for anything, and owing to an inward self-contempt, seek to *lay the blame for themselves somewhere else*" (*BGE* 29). Likewise, a system of ethics would be subject to the same critiques. If one decides to subscribe to a particular moral leaning, all of their actions are subject to judgment based on that structure; in many ways, this is also a rejection of one's responsibility—no reason to think for oneself when you can simply obey a list of commandments.

Mitchell does bring up many great points about the situatedness of self-overcoming, pulling from the work of Robert Pippin: "the conditions described as necessary for…self-overcoming are clearly here historical (dependent on one's time) and social (dependent, in some way, on the state of a shared social world)" (qtd. in Mitchell 333). However, Mitchell takes it further by introducing his idea of a self-evaluative framework to this situatedness, which is where I believe he begins to stray from Nietzsche's vision. It would be far-fetched to try and argue that self-overcoming does not involve any kind of self-evaluation. However, we must be very careful about using such terms without making our intentions abundantly clear. In order to "do" self-overcoming, we would have to participate in a revaluation of values, and we would have to rethink our prejudices and any normative standards to which we default. However, Nietzsche seems to support a kind of activity that is independent from any normative framework (and I believe this would include a self-evaluative framework such as the one Mitchell proposes). Nietzsche's remark, "Blessed are the forgetful," comes in a passage about "those who attach great value to being credited with moral tact" (*BGE* 146). Nietzsche sets up the "forgetful" as a foil to those who pride themselves on being moral; there is much to be gained by being forgetful and getting rid of any attachment to any kind of morality. Self-evaluation is necessary, but in order to be self-overcoming, it must happen outside of any ethical framework. I believe this forgetfulness also entails an abandonment of a typical conception of a "self," which I will expand on during my discussions of The Birth of Tragedy.

Part One: Ego and The Birth of Tragedy

One of Nietzsche's missions in *The Birth of Tragedy* is to provide a survey of Greek tragedy—to map out its birth, life, eventual death (or murder), and the possibility for its rebirth. In doing so, he attempts to identify some of the leading forces at work in art and, therefore, in human life. He borrows the names of the Greek gods Dionysus and Apollo to better illustrate these forces: what he calls the Dionysiac and the Apolline.[1] These two forces are in opposition to one another. However, there are many art forms in which the forces are "coupled," and paradigmatically, Nietzsche

focuses on their powerful synthesis found in Greek tragedy. In the following sections, I will first attempt to explain Nietzsche's position on the Dionysian and Apollonian and what makes Greek tragedy distinct. Then, I will provide a reading of the tragedy of Oedipus and use it to introduce the notion of ego to Nietzsche's conception of tragedy; I will argue that "ego" is closely related to what Nietzsche calls "individuation." From there, I will move on to Part Two and explain how *Beyond Good and Evil* is related to these themes.

Section I: Apollonian and Dionysian

Greek tragedy is primarily characterized by its delicate balancing of Apollonian and Dionysian themes. For Nietzsche, the Apollonian, described as the art world of dreams, represents the following: self-control, clarity, harmony, and the Principle of Individuation (*The Birth of Tragedy,* 15-16). The Dionysian, described as the art world of intoxication, represents the instinctual, ecstasy, chaos, and unity (*BT* 17). The tension between these two worlds is the foundation of Greek tragedy. To illustrate, Greek tragedies exemplify the Apollonian self-knowledge that helps us understand when Dionysian excess is necessary. Furthermore, Nietzsche insists that these two states "intensify" one another (*BT* 27). In other words, they work together to create a specific effect in tragedy. This seems counter-intuitive. First, it seems that the opposite of excess in art should be asceticism, or, in other words, a lack of spirit. However, Nietzsche opposes excess (the Dionysian) with moderation (the Apollonian) instead. Intuitively, moderation seems to fit better as the balance *between* excess and asceticism, not as an oppositional force to excess.

This can be solved relatively simply, though: asceticism has no place in art. That is to say, a lack of spirit would seem to indicate that no art would be produced at all. Then, in regard to art, asceticism cannot be a factor. Nietzsche criticizes the works of Euripides for a similar reason: Socratic reasoning has no business in Greek tragedy. Like asceticism, it is non-artistic altogether; then, it stands to reason that asceticism's inclusion in art would only hurt art's purposes. Of course, the god-figure Apollo represents logic, so this is by no means an assertion that Nietzsche rejects logic as a whole. One of Nietzsche's critiques of Socrates is that he equates virtue with knowledge, and this lack of spirit is the type of logic he detests (*BT* 69). He even invites readers to imagine what Socrates might see when he rests his "Cyclops eye" upon tragedy: "What would it see in what Plato called the 'divine and praiseworthy' art of tragedy? Something utterly irrational, full of causes without apparent effects, effects without apparent cause; and all so diverse and many-hued that it would repel a sober temperament, but dangerously inflame sensitive and susceptible souls" (*BT* 67). Thus, one like Socrates, who practices a type of asceticism,[2] would see no need for art. Therefore, it makes sense to have moderation—not Socratic logic or

unexpressive asceticism—as the opposing and complementary force to Dionysian excess in art.

I use "complementary" because Nietzsche saw Apollo and Dionysus as opposing figures, yet equally necessary. If we lean too far into the Apolline, we become overly contemplative and introspective (*BT* 26). We retreat into ourselves and become hyper-individual. If we stray too far into the Dionysiac, we give ourselves over to excess and participate in "self-oblivion" (*BT* 27). In other words, too much excess eventually destroys that entity that acts excessively. Nietzsche describes Greek tragedy paired with the "dramatic dithyramb"[3] as a common goal between the two forces, which I read as a sort of reconciliation between the two.[4] Greek tragedy consists of a dithyramb-like chorus and actors. This structure avoids the problems that arise with a sculpture or dithyramb alone: sculptures are pure image while dithyramb is primal rhythm (*BT 29-30)*. Greek tragedy combines the chorus with accompanying imagery (and movement of the actor rather than the immanent statue), which produces an effect more meaningful than either could achieve alone. A Dionysiac lacks the form needed to produce a compelling and coherent myth, while the Apolline lacks the passion necessary to create art. Thus, this is also why Nietzsche insists that "Apollo could not live without Dionysus!" (*BT* 26)

Section II: Apollo and Dionysus as Ego and Nature

Now, as I want to argue, another aspect necessary to Greek tragedy is the interplay between ego and nature. As I see it, this mirrors the tension between Apollo and Dionysus, those forces at work both in art and in human experience. A common theme in Greek tragedy is a main character who attempts to overthrow nature with their own ego. To illustrate, I will examine the story of Oedipus found in Sophocles' *Oedipus Rex* and *Oedipus at Colonus*.[5]

Laius, the king of the cursed city of Thebes, has a son with his wife Jocasta and consults an oracle to tell his fortune. To his horror, the oracle prophesies that Laius will be killed by his son. In an attempt to prevent this, he binds his son's feet and orders Jocasta to kill him. This is the first example of the prioritization of one's ego over nature. Unable to commit the murder of her child, Jocasta orders a servant to carry out the job. Laius believes he can change his fate by killing his son, but this choice sets in motion the very prophecy that he is attempting to overcome.

There are conflicting versions of what the servant does, but either way, the son ends up in the hands of a shepherd who names him Oedipus and gives him over to Polybus, the childless king of Corinth. Later on in his life, Oedipus hears a rumor that he is adopted and consults the Oracle at Delphi for answers on his parents. Rather than provide an answer, the oracle tells him he will murder his father and mate with his mother. Horrified, he

leaves Corinth in an attempt to escape this fate, still believing that Polybus and Merope are his true parents. This is the second instance of a character believing his will can overtake what is written in nature; like his father, Oedipus is dissatisfied with his destiny and sets out to change it.

Oedipus ends up killing his father, known only to him as an old man he argued with over right of way on the road. Oedipus finds himself at Thebes, where he encounters a Sphinx and solves her riddle, thereby ending the curse over Thebes. His prize is the kingship of Thebes and the hand of its widowed queen, Jocasta. Both prophecies are fulfilled.

However, it is important to consider the idea that if Oedipus had been raised by his father and mother, he most likely would never have committed such taboo acts against them. Alternatively, if Oedipus had remained in Corinth, he probably would have never encountered his true father on the road. The idea arises that the ego itself acts as a driving force of tragedy; the tragic figure is one who is confronted with his own powerlessness in comparison to the idealized conception of his own will. He realizes he, despite his pride or ability, is still subject to nature in one way or another. As Nietzsche puts it, "We stretch our hands towards one thing, and nature deceives us to achieve the other" (*BT* 24). We can attempt to exert our will over nature, but we are still affected by our circumstances.

Thus, ego is at the center of tragedy, illustrated by the odd compromise between the Apolline and the Dionysiac. Just as the man of culture "[shrivels] up into a mendacious caricature" before the primal satyr, the ego is shown to perpetuate its own destruction (*BT* 41). However, the problem Nietzsche describes is not necessarily ego or culture itself as it may initially seem. What Nietzsche is concerned with is when culture "[masquerades] as the sole reality" (*BT* 41). The man of culture mistakenly believes he has triumphed over nature, but he misunderstands what nature truly is. Nietzsche criticizes modern tragedy for its portrayal of the delicate shepherd, which seems to illustrate his problems with the culture of the time: "Modern man's idyllic shepherd is nothing but a counterfeit of the sum of cultural illusions that he takes to be nature" (*BT* 41). The man of culture views society and culture as the pinnacle of man's potential; he has conquered and subordinated his primal nature and is no longer subject to nature's whims. However, what *The Birth of Tragedy* tells us is that the Dionysian and Apollonian work in tandem. One does not triumph over the other, and so this view of the self as the peak of humanity must be misguided.

Part Two: Persisting Themes in Beyond Good and Evil

Part of Nietzsche's project in *Beyond Good and Evil* can be identified from the title alone: Nietzsche is outlining a philosophy that goes beyond the bounds of traditional ideas regarding morality. This philosophy would be able to avoid getting caught up in debates over concepts like "good

versus evil." However, a philosophy such as this is viewed as dangerous by the dominant discourses: "To recognize untruth as a condition of life—that certainly means resisting accustomed value feelings in a dangerous way and a philosophy that risks this would by that token alone place itself beyond good and evil" (*BGE* 12). What Nietzsche is calling attention to here is the idea that any kind of certainty we may believe we have about morality is simply a prejudice, or an "accustomed feeling." To resist going along with the typical value judgements set forth by society or philosophy (or any other kind of discourse) would be a step in the direction of going beyond good and evil. Nietzsche will argue that these conceptions of good and evil arose out of egoism and a weak will to power, and we would be better off without them. Nietzsche identifies a "new species of philosophers," the philosophers yet to come, that would embody this quality of revaluation (*BGE* 10-11). The philosophers yet to come seem to fit Nietzsche's description of the *Übermensch*, or overman.[6] We will return to this concept later on.

Section I: Self-Overcoming as it relates to *The Birth of Tragedy*

The philosophers yet to come are able to recognize the value of suffering. Self-overcoming entails several different qualities, including the welcoming of hardship rather than the rejection of it:

> You want, if possible—and there is no more insane "if possible"—*to abolish suffering*. And we? It really seems that we would rather have it higher and worse than ever. Well-being as you understand it—that is no goal, that seems to us an end, a state that soon makes man ridiculous and contemptible—that makes his destruction *desirable*. (153)

The destruction of man, or his self-overcoming, can be taken, in part, literally. When one overcomes himself, he rids himself of the notion that he is in any way a unified whole. Those who wish to abolish suffering could be compared to those "men of culture" that Nietzsche despises in *The Birth of Tragedy*. If the *Übermensch* overcomes himself and the set of values society sets for him, he must be constantly engaged in acts of creation; without a value system, every action is new—none of them can come from the same place.[7]

This focus on self-destruction and intense creativity is strikingly similar to the figure of Dionysus, which Nietzsche describes as being the original tragic hero (*BT* 51). Dionysus was dismembered by the Titans, giving him a two-faced nature. These two natures were ecstasy and wrath. Nietzsche determines that the dismemberment of the tragic figure Dionysus reveals that "the condition of individuation [is] the source and origin of all suffering" (*BT* 52). If we take individuation as another way of describing the

ego or individualism, then the connections between *The Birth of Tragedy* and *Beyond Good and Evil* become clearer. Greek tragic figures attempt to assert their individuality as a way to triumph over nature, which causes them pain and suffering. Dionysus' dismemberment—his loss of unity—makes him the ultimate tragic figure. If we read this with self-overcoming in mind, we understand that Nietzsche means tragedy a bit differently than what we might originally assume: Dionysus is "tragic" not in the sense that we pity him for suffering but because he has been forced into individualism— Nietzsche sees this egoism as contemptible.

However, Dionysus' story does not end with this individualism: Dionysus is reborn into a whole, no longer individuated. It is through Dionysus that Nietzsche says the "mystery doctrine of tragedy" is found: "the basic understanding of the unity of all things, individuation seen as the primal source of evil, art as the joyful hope that the spell of individuation can be broken, as a presentiment of restored oneness" (*BT* 52). This passage is crucial for a number of reasons. First, the idea of individuation as the source of evil seems to connect with the picture Nietzsche gives us of the philosophers yet to come. Anyone wrapped up in their ego will be equally wrapped up in making value judgements to reassert their superiority over others. In other words, the assertion of any objective morality (secular or religious) necessarily involves a kind of egoism. Then, the source of evil— or the source of typical morality—is the ego of philosophers:

> Gradually it has become clear to me what every great philosophy so far has been: namely, the personal confession of its author and a kind of involuntary and unconscious memoir; also that the moral (or immoral) intentions in every philosophy constituted the real germ of life from which the whole plant had grown. (*BGE* 13)

Ego is "evil" in another way as well: it keeps us from our full potential. The *Übermensch* is "over" others but will find no need to profess that fact to them: to the *Übermensch*, everyone else is a gnat. Without an ego, we are able to reach our highest potential; that being said, without an ego, we will probably not feel compelled to brag about it.

In addition, the other crucial aspect of the above passage has to do with the "presentiment of restored oneness" (*BT* 52). What makes Dionysus different from the *Übermensch* is this eventual reintegration into a unified whole. For Dionysus, this wholeness has to do with a radical embracing of community. This happens with the dithyramb:

> In the Dionysiac dithyramb, man's symbolic faculties are roused to their supreme intensity […] In order to grasp

this total liberation of all symbolic forces, man must
already have reached that peak of self-negation that seeks
symbolic expression in those powers. (*BT* 21)

The Dionysiac precipitates this self-negation (or self-overcoming)
by participating in a communal, rhythmic song and dance. In many ways,
the core of self-overcoming in *The Birth of Tragedy* can be read as the hyper-
communal; this is not the case for the *Übermensch*. While the Dionysiac
replaces his ego with community, the *Übermensch* retains his individualism.
He is not individual in the sense that he is egotistical; he is literally
individual—he is totally alone.

This isolation is due to what Nietzsche refers to as the "herd
morality" (*BGE* 114). The herd morality is a subversion of the will to power;
strength is threatening to those who are weak, so the herd morality arises
out of a need for security. The *Übermensch*, constantly involved in acts of
creation, is a threat to the herd:

The highest and strongest drives, when they break out
passionately and drive the individual far above the
average and the flats of the herd conscience, wreck the
self-confidence of the community, its faith in itself, and
it is as if its spine snapped […] High and independent
spirituality, the will to stand alone, even a powerful
reason are experienced as dangers; everything that
elevates an individual above the herd and intimidates the
neighbor is henceforth called *evil*. (*BGE* 113-114)

Then, the concept of the philosopher yet to come is diametrically
opposed to any kind of community. Obviously, somewhere along the way,
Nietzsche changed his stance on the role of community. The idea that tragedy
is necessary remains throughout his work, but he seems to shift his focus.
The Birth of Tragedy does introduce the idea that we can gain something
from tragedy, but it is certainly much more focused on a communal—even
cathartic—experience. Eventually, he takes a more opportunistic view,
seeing suffering as a means of strength.

Section II: Tragic Consolation
A delicate balancing act between ego and nature—and the Apollonian
and Dionysian—is required to experience tragedy properly. For Nietzsche, a
proper tragic experience involves a form of consolation that comes about by
viewing the tragic acts portrayed on the Greek stage. This consolation cannot
occur if the viewer is too wrapped up in the Apolline illusion to recognize
tragedy. In other words, if audiences get too caught up in the spectacle, there
will be no room for them to reflect on the significance of the images being

portrayed. Likewise, there cannot be any comfort in staring dreadfully into the abyss;[8] too sharp a focus on the tragic also prevents one from looking further into its purpose. This is the "reciprocal necessity" that Nietzsche describes—the blending of "the Apolline world of beauty [and] the terrible wisdom of Silenus"[9] in order to fully understand tragedy and be consoled by it (*BT* 25).

Nietzsche introduces the idea of comfort in the face of the terrors of life early on in *The Birth of Tragedy*: "The Greeks knew and felt the fears and horrors of existence: in order to be able to live at all they had to interpose the radiant dream-birth of the Olympians between themselves and those horrors" (22). In other words, Nietzsche asserts that in order to go on living despite the pessimism of Silenus' wisdom, the Greeks created a force that stood between themselves and the abyss, that force being the gods at Olympus. The Greeks' deific solace functions similarly to the Apollonian dream-lens, which allowed them to find peace amongst the misfortunes of everyday life. This Apollonian illusory state "reveals to us how the whole world of torment is necessary so that the individual can create the redeeming vision, and then, immersed in the contemplation of it, sit peacefully in his tossing boat amid the waves" (*BT* 26). In other words, viewing tragedy somehow inspires us to have a hopeful outlook. By showing us that "redeeming vision," tragedy justifies itself; hope would be meaningless without torment. This contemplation of the interdependence between tragedy and redemption offers peace.

We, as individuals, seem akin to the two-faced Dionysus, individuated into singular beings (egos) and separated from the unified whole. With his ideal of moderation, Apollo gives us the ability of self-knowledge; by better understanding ourselves individually, we get closer to understanding unity. The sheer weight of existence makes life without tragedy impossible, so the "metaphysical consolation" brought about through tragedy gives us the ability to delight in our existence as Dionysus does: "For all our pity and terror, we are happy to be alive, not as individuals but as *the* single living thing, merged with the creative delight" (*BT* 80-81). Now Nietzsche's fascination with the dithyramb begins to make some sense; a group of individuals overcoming their individuation (egos) and becoming unified through art is the crux of authentic tragic experience. The sheer force of nature overcoming man's will could be read as another representation of the individual becoming unified under tragedy. The man of culture, refusing to acknowledge primal nature, believes he is in control of his circumstances. He hides under dialectic and false humility, insisting he has transcended the subjectivity of existence. However, the day will eventually come when he is proven false; he is no more in control of his circumstances than he is of the weather. Unforeseen consequences will always be a part of life, and

nature 'runs its course' in the sense that he will always see the power of these consequences. His pride is empty because he places himself above nature instead of realizing that they are reciprocal and interdependent. The ego demolished is a picture of the toppling of the false idol of individuation; man is forced into genuine humility, finally comprehending the unity of all things.

In *The Birth of Tragedy*, consolation has to do with a sense of peace despite suffering, but suffering takes a different role in *Beyond Good and Evil*. Nietzsche criticizes those who hate suffering because they rob themselves and others of the growth that can come from it (*BGE* 116). According to Nietzsche, the hatred of suffering is common, especially in terms of the herd morality. Nietzsche makes his case for a new kind of philosophy that will allow humankind as a whole to reach new heights:

> Toward *new philosophers*: there is no choice; toward spirits strong and original enough to provide the stimuli for opposite valuations and to revalue and invert "eternal values"; toward forerunners, toward men of the future who in the present tie the knot and constraint that forces the will of millennia upon new tracks. […] It is the image of such leaders that we envisage: may I say this out loud, you free spirits? The conditions that one would have partly to create and partly to exploit for their genesis; the probable ways and tests that would enable a soul to grow to such a height and force that it would feel the *compulsion* for such tasks; a revaluation of values under whose new pressure and hammer a conscience would be steeled, a heart turned to bronze, in order to endure the weight of such responsibility. (*BGE* 117)

Nietzsche's assertion that suffering is valuable remains the same but takes up a different purpose in his existentialism. In fact, Nietzsche later added a section at the beginning of *The Birth of Tragedy* called "An Attempt at Self-Criticism," in which he discusses the work from his perspective fourteen years later. In this self-criticism, Nietzsche calls *The Birth of Tragedy* "badly written, clumsy, and embarrassing," but still finds appreciation in its "strange knack of seeking out its fellow-revellers and enticing them on to new secret paths and dancing-places" (*BT* 5). In other words, he finds it to be poorly done but still admits its value, especially in terms of its exploration of the Dionysiac. Nietzsche comes to both criticize and appreciate his early work, and he certainly cannot deny that he retains certain influences throughout his body of work.

CONCLUSION

Interestingly, Nietzsche's shift in attitude towards *The Birth of Tragedy* seems to mirror his shift in attitude towards tragedy. Suffering and tragedy still hold importance in Nietzsche's later works, but his attitude towards community changed, as discussed in Part Two, Section I. Nietzsche seems to at least retain his focus on the Dionysiac since he calls Zarathustra a "Dionysiac monster" (*BT* 12). His view of the Dionysian does seem to conflate with the *Übermensch* later on in his works, despite their differences. Much of the wisdom of the philosophers yet to come can be found in *Thus Spoke Zarathustra*, so to refer to Zarathustra as Dionysiac seems to represent a synthesis of his early and later work. If the Dionysian comes to represent the philosophy yet to come, it seems that it loses its focus on community and gains an emphasis on strength and individuality. Of course, this individuality does not have anything to do with "the self" but is more concerned with the isolation that comes from the exertion of a strong will to power. On the surface, these two works appear to be extremely dissimilar, and in many ways, they are. However, reading them in synthesis proves that they are more compatible than it might initially appear. Though Nietzsche's views evolve as his work evolves, it would be impractical to treat his works as entirely separate. By reading *The Birth of Tragedy* alongside *Beyond Good and Evil*, new facets of Nietzsche's thinking are able to reveal themselves. As I hope I have shown here, there is much to be gained from reading Nietzsche's writings as a cohesive body of work rather than focusing on each work in isolation.

Endnotes

[1] These are also called the Dionysian and Apollonian depending on grammatical context.

[2] To his credit, Socrates did not practice the traditional conception of asceticism, which would prevent giving into any type of indulgences. Some take it as far as eating only bland food and practicing extreme minimalism or homelessness. The type of Socratic asceticism I am referring to is more about his views on the transcendence of the physical world and his rejection of subjective experience.

[3] The dithyramb, called "the song of Dionysus" by Archilochus, involves a rhythmic, improvised song and dance. It is typically described as wild or unruly because it lacks the form of traditional poetry and, of course, because of Dionysus and his followers' proclivity to drunkenness. See "Greek Poetry: From Homer to Seferis" by C.A. Trypanis.

[4] To clarify, I do not mean a compromise or combination of moderation and excess. Rather, the two become separate facets of the same entity. Greek tragedy then demonstrates an understanding of when moderation or excess is necessary; this self-knowledge of imagination's necessity illustrates the allyship between the Dionysian and the Apolline.

[5] I paraphrased the following summary by reading the copies of each tragedy on the

Internet Classics Archive, which does not feature page numbers. See my Works Cited at the end for their citations.

[6] I will be using "philosophers yet to come" interchangeably with "the Übermensch," as they seem to be referring to the same kinds of figures in Nietzsche's work.

[7] The Übermensch could perhaps commit the same action more than once, but it would have to be out of a new act of creation rather than as a pattern of behavior. This is related to the "forgetfulness" that I discussed earlier.

[8] That is, viewing the Dionysiac primal nature without any "buffer."

[9] Silenus' wisdom is that "The best of all things is…not to be born, not to be, to be nothing. But the second-best thing for you—is to die soon." BT, 22

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ETHICS IN AESTHETIC NURSING:
A LITERATURE REVIEW

Nursing school provides future nurses with a foundation of knowledge to provide patients with effective, quality, and safe care. Throughout the program, the student nurse learns the basics of each category in nursing from a moral and ethical standpoint to specialty fields. However, nursing school solely covers the traditional parts of nursing; this excludes fields such as aesthetic nursing. After the student graduates, it is their responsibility to attain certification or credentials in an area of interest. Aesthetic nursing differs from traditional nursing in a manner that thrives through social media usage; aesthetic nurses target their audience using platforms such as Instagram, Facebook, Twitter, and commercial advertisements. Lines tend to become blurred with the code of ethics as nurse practitioners and registered nurses in aesthetics earn their living from the reputation of work they do for others. Typically, aesthetic nurses perform non-invasive procedures on patients who desire a change in their body appearance; procedures can range from Botulinum injections to CoolSculpting. With aesthetic nursing becoming a popular, lucrative field, there is concern regarding registered nurses' ethical and moral stances. Due to the lack of a standard approach to measure nurse competency, patients' safety may be compromised when obtaining aesthetic procedures leading to poor patient outcomes.

Patients who arrive at the emergency department with botched appearances are ongoing and constant issues in this line of work. Many people who obtain these procedures can have complications later and must deal with tissue scarring and bruising that lead to more significant health concerns. A consequence of the problem can lead to the client finding themselves in a continuous cycle, paying to correct botched surgeries, which range from thousands to hundreds of thousands in U.S. dollars. It impacts one financially, but it can also affect their self-esteem and how they view themselves.

BY DAIJA WALTON

With the lack of exposure, insufficient education, and training, there is a concern regarding ethical standards, safety precautions, and morality in aesthetic nursing; this reveals a flaw in the route newly graduated nurses take to becoming aesthetic nurses. In this paper, I will begin by analyzing five articles that describe what the patient seeks in an injector and look at the regulations and guidelines of general nursing practice. Next, I will explain how I conducted my literature review by listing the databases and keywords I used. Following the methodology, I will compare data from two studies that give the registered nurses' perspectives in contrast to various plastic surgeons' perspectives on nurse injectors. Finally, I will conclude with a discussion of my final thoughts and suggestions for combating ethical issues in aesthetics.

BACKGROUND/ANALYSIS OF LITERATURE

The purpose of Christopher Holmberg's (2020) interview study was to obtain the perspective of registered nurses regarding ethical standards in aesthetic nursing. An ongoing concern stems from nurses being able to practice non-invasive procedures on patients autonomously. There are no regulatory guidelines or higher levels of credentialing needed to do this. Registered nurses can perform non-invasive procedures such as injectable dermal fillers, Botox, chemical peels, and various skin rejuvenation therapies (Holmberg, 2020). Since no surgery is required to achieve particular looks, aesthetic procedures are highly desirable. Typically, this patient population seeks perfection in their features, and over time disorders may form (Vally, 2019). Patients continue to return in hopes of achieving the look they are striving to obtain. This creates a moral issue in aesthetic nursing. Nurses are forced to decide between a patient's mental health or a profit from their business; nurses and nurse practitioners should recognize when patients

seeking perfection are an issue. (Holmberg, 2020) mentions how aesthetic nursing is not well regulated; this field lacks a standard protocol for aesthetic nurses that each practice should follow. With no requirement for a nurse practitioner license or traditional academic approach for aesthetics, a need to develop standards in this field is due. Registered nurses can practice without the supervision of nurse practitioners when they are handling injections; often, nurse practitioners are not even found in the facility while registered nurses are executing aesthetic procedures (Holmberg, 2020). This leaves nurses responsible for maintaining a safe, hygienic practice that aligns with ethical standards.

A qualitative study was conducted on 13 registered nurses who were expected to answer the following questions: "How Do the Nurses Uphold Medically Safe Practice?" and "How Do the Nurses Uphold Sound Ethical Standards?" Some participants explained how they partook in training and courses outside of nursing school to become more competent; the initiative taken demonstrates a sense of credibility to patients. Another route participants took involved engaging in professional networks such as Facebook and LinkedIn to connect with nurses across the board, share ways to practice evidence-based learning, and discuss ethical issues that may present themselves when practicing in this field. Some nurses mentioned using YouTube to further their knowledge of medical information within aesthetics. The last thing participants said involved working in other branches of nursing. This is vital because other nursing units have a steady framework and various guidelines on practicing nursing safely. One nurse emphasized that a solid medical background is needed before working in aesthetics because it is an autonomous job; having confidence and being secure in what is being practiced is critical in case of emergent situations.

A common theme in the answers participants gave included their respective facilities creating clinical guidelines and local policies for the practice. Policies covered the proper before and after actions following procedures and safety protocol should any complications arise (Holmberg, 2020). Other measures participants mentioned are crucial to ensure patients of credibility and qualification to perform the non-invasive procedures; maintaining medical/ethical standards directly correlates with patient satisfaction. Although there is no particular framework for practicing within aesthetics, general nursing precautions and standards should always be followed.

Furthermore, the purpose of Small's (2014) question survey was to obtain the perspectives of plastic surgeons regarding nurses being competent enough to perform filler injecting. Varying opinions are held on who is capable of administration, considering the complexity level of administering injectable fillers. Currently, laws vary from state to state when dealing

with who can inject. For example, Alabama considers injections a medical therapy; only physicians have the power to perform non-invasive aesthetic procedures (Small, 2014). However, the state of California allows registered nurses to practice aesthetics under the supervision of a practitioner (Small, 2014). Over three months, an anonymous online survey was conducted. The survey consisted of eight questions: two asked about the location of where the plastic surgeons practiced, and the others asked specific questions about the capability to inject. Small sent out the survey on websites such as the American Society for Aesthetic Plastic Surgery (ASAPS), the International Society of Aesthetic Plastic Surgery (ISAPS), and the American Society of Plastic Surgeons (ASPS); they are global websites for healthcare members in aesthetics. Participants had one week to return their responses; responses were electronically totaled through a ranking system.

Seventy seven percent of participants responded that nurses were not as capable as plastic surgeons in Botox administration, and 81% said the same for dermal fillers (Small, 2014). While the capability of Botox injections was the primary purpose of this study, it was compared to registered nurses being as capable as plastic surgeons in administering vaccines. 84% of participants believed that registered nurses were as skilled as plastic surgeons in vaccine administration. Since registered nurses are taught in nursing school how to give vaccinations and different types of injections (i.e., subcutaneous, intramuscular, intravenous), participants felt more comfortable selecting yes to that question. Moreover, (Small, 2014) noted that patients seek out three things when looking for aesthetic service: the injector's amount of experience, the amount of training the injector has, and the specialty field of the injector. This is where things tend to blur; there is no set route nurses take in entering the field of aesthetics. Training for each person varies as there are different course lengths and rigor. A certification in injections does not necessarily mean that the nurse exhibits the appropriate amount of experience when handling fillers.

Hospitals do not need advertising since there will always be someone who needs medical attention; however, aesthetic nursing is a field that relies heavily on commercial advertising, word of mouth, and in most cases, social media, and networking (Holmberg, 2020). Cosmetic work needs to be performed and posted to a social media outlet to attract the attention of others and to grow a person's business in this field. Due to this reason, not all aesthetic nurse practitioners and registered nurses have the best interest of the patient. This business thrives off the target audience being people who may have self-esteem issues and body dysmorphic disorders that warrant the need to change their appearance or enhance their body's features; with this being the case, many nurses run into issues with morality. According to Vally (2019), people who possess higher self-esteem about their bodies are not

obliged to obtain cosmetic procedures. Therefore, the lower self-esteemed clients are subject to attaining multiple surgeries and procedures to fulfill their need of succumbing to societal norms.

Moreover, ethical dilemmas are prevalent in this field since the objectives of aesthetic procedures differ from those of a therapeutic standpoint (Nejadsarvari, 2016). For instance, reconstructive surgery has a similar effect as cosmetic surgery; however, the difference lies in the situation. An individual may need reconstructive surgery due to trauma or disaster, whereas cosmetic surgery for low body positivity is not detrimental to one's health. The surgeon or nurse practitioner more than likely has a greater conscience of morality in a trauma incident than the cosmetic procedure. The meaning behind this doctrine lies with the cosmetic industry being a commission-based profitable business (Vally, 2019).

Today, it is socially acceptable for nurses, nurse practitioners, dermatologists, and other healthcare personnel outside of the plastic surgeon title to perform cosmetic procedures; lack of knowledge and practice raises concerns from an ethical standpoint (Nejadsarvari, 2016). False advertisement of work leads to deception and moral conflict within the business. (Nejadsarvari, 2016) mentions a violation of ethics, nonmaleficence, due to the surgeon not performing the cosmetic procedure; this creates the statistic of people with botched appearances (Nejadsarvari, 2016). A repetitive cycle forms as the client seeks to correct the mistakes of the previous person; this is where the client's mental health starts to degrade. It is good ethical and moral practice when a healthcare professional notices the client's mental state and offers resources for help in ways that do not resort to having more procedures done on their body. It is important to recognize addiction to various procedures and when it is time to bring in psychiatric help. Therefore, nurses must do a consultation before any non-invasive or invasive procedure to measure the patient's expected outcomes.

Because the aesthetic nursing industry flourishes from networking and advertisement, clinics may not establish a genuine rapport between the client and nurse. (Park, 2018) conducted a study that concluded that the advertisement of work shared on social media platforms proves to be more trusted by the public than office pictures that display "after only" posters of clients, which could have been photoshopped. Due to clients trusting the nurse's work completed on others, an understanding of the ideal outcome between the client and nurse may not be developed. This vital step is one of the main reasons for error; the client basing their expected outcomes on another client's experience leads to confusion about what they truly want (Park, 2018). While this is not a direct matter of ethics, it can indirectly be tied to malpractice. For instance, a patient who presents with a smaller set of lips may want to fill theirs to match a celebrity whose lips appear fuller.

To achieve this outcome, the nurse may avoid sound judgment and take matters into their hands by doubling the prescribed injection. In reference to this example, the double dose of lip filler could cause tissue damage to the client; this positions the nurse in a liability to be sued with malpractice. This fictitious incident occurs often and could be avoided with proper consultation, a realistic set of goals based on the patient's natural features, and better judgment from the nurse.

However, there is a tool that nurses use to avoid situations such as this: Six-Step Decision-Making Model for Determining Nursing Scope of Practice. This tool helps the nurse decide if the act is in their scope of practice or not (Registered Nurses, 2019). Although this tool is provided, not all nurses may choose to use it based on the confidence in their training and previous experience in the nurse's education and skill. Since there are no designated holistic courses offered in aesthetics within global nursing programs, the nurse must rely on outside sources to acquire knowledge in this realm of nursing. Not all nurses take the same reputable certification courses, which leaves room for inadequate training.

DESCRIPTION OF RESEARCH METHODOLOGY

I began the research process with keywords that pertained to the topic instead of long, drawn-out phrases; this is where I ran into difficulties deciphering the valuable information. Selecting "peer-reviewed" cut down on some of the results found; however, I disregarded peer-reviewed articles if I wanted to broaden the search. I changed search engines from within in individual databases, such as ProQuest; this technique helped expand the result. For example, since the topic is aesthetic nursing, I narrowed my search by selecting a database that regarded only nursing and sociology instead of involving irrelevant fields such as biology or politics.

The database ProQuest yielded various helpful articles that were available for access. The topic I began to search in this database involved ethics and safety procedures in aesthetic nursing. Due to the lack of resources in preparing for this field as a nurse, ethics is the most sought-out and concerning the aesthetic nursing subject. It was not difficult to find an article involving ethical guidelines problems. I did not need to use "AND," "OR," and "NOT"; I solely used the first search bar and typed "aesthetic nursing." In the CINAHL database, the topic searched involved the similarities between aesthetic nursing and cosmetic dermatology; I used the "AND" search term and did not find valuable results. After unsuccessful attempts in using "AND" I strictly used the first search bar and searched "Dermatology Field," which produced Vally's article. The last database I used was Medline; the topic searched in this database involved the continuous need for aesthetic nursing.

Moreover, I identified the thesis of this paper by completing a Problem, Intervention, Comparison, Outcome (PICO) worksheet. This

led to the realization that most of the population that has work done to their bodies, including but not limited to Botox, fillers, lip injections, and dermaplaning, are adolescents to middle-aged people (Holmberg, 2020). I then compared the safety procedures and ethical standards put in place in the medical spa versus the hospital. While all facilities, albeit the hospital or medical spa, abide by the Centers for Disease Control's (CDC) standard safety precautions, each facility varies in requirements from staff. Although the medical spa is not set in an intense environment, nurses must always follow infection control precautions.

ANALYSIS OF RESEARCH DATA

I chose two studies to analyze data: the first one is an interview study. It is a qualitative level VI study; it was conducted in Sweden. The inclusion criteria included practicing as an aesthetic nurse for at least two years. The age of participants ranged from 18-65 years. One participant was male. Data collection occurred over four months. Qualitative questions included: "What ethical aspects do you consider in your practice?" and "How do you balance the patient's wishes and professional opinions?" The interview approach best encapsulated the subjective perspectives of registered nurses as the aim of the study was to explore how the nurses viewed popular medical and ethical issues with practicing in this field (Appendix A.). Conducting individual interviews allowed the interviewer to synthesize participant responses and compile data into categories to compare the similarities in answers. Results yielded overarching themes in participants' responses (Appendix A.). From the responses, Holmberg created three categories that explored the crucial lengths participants took to ensure safe, sound ethical practice. The main categories were then broken down into subcategories that elaborated on the nurses' views.

The second study is a questionnaire survey; it is a level V study containing global participants. The inclusion criteria included various healthcare personnel: plastic surgeons, dermatologists, gynecologists, dentists, nurses in plastic surgery/dermatology, and other fields. Data collection occurred over two months. Qualitative questions included eight questions (Appendix B.). Results stated that 14,184 plastic surgeons viewed and identified themselves as ASAPS, ISAPS, or non-ASAPS in the study; however, 882 plastic surgeons answered at least one question (Small, 2014). 77% of plastic surgeons believed that nurses were not as capable of Botox injections.

In comparison, 84% of plastic surgeons believed that nurses were as capable as physicians in flu and other vaccine administration. Overall, 98% of plastic surgeons believed themselves and dermatologists to be most capable in Botox administration. While the perspective of plastic surgeons explicitly shows strong beliefs in who should administer Botox and other

fillers, patients continue to seek performance from providers who are not plastic surgeons. This includes comfortability and the establishment of a relationship between patients and other providers, the inability to find plastic surgeons or dermatologists in the surrounding area, the variation in cost among providers, and the knowledge level of complications that may arise during procedures (Small, 2014).

LIMITATIONS

As I mainly focused on comparing two studies, I chose to dissect the limitations of Christopher Holmberg and Kevin Small's studies. Holmberg's study only incorporated 13 registered nurses in Sweden. The population was limited as he stated that official registers of the list of aesthetic nurses that practice in Sweden does not exist. Thus, the representation for this study is small and only accounts for a specific area. Another limitation to be considered is participant honesty. Participants mentioned how they followed ethical guidelines throughout the study but knew of clinics that did not. This may come off as selection bias due to their willingness to participate in the research and other clinics not participating (Holmberg, 2020).

Contrary, Small's study incorporated almost 900 plastic surgeons globally through online surveying from multiple sources. The problem lies behind people who responded to the survey speaking for the whole population of plastic surgeons; not all responders fully participated in the survey, as some questions were left blank. The survey was only sent out to plastic surgeons, excluding nurses who practice aesthetics. The questions in the survey were closed-ended and did not offer the possibility for plastic surgeons to elaborate on their responses, which may have raised questions from the readers (Small, 2014).

CONCLUSION AND DISCUSSION OF RESEARCH FINDINGS

An explicit framework for practicing in aesthetics does not exist; however, methods to manage practice are constantly identified by nurses in aesthetic practice. Aesthetic nursing is a field that requires specialized skills, constant teamwork and collaboration, and the willingness to learn new methods and techniques continually. The line that separates medicine and cosmetics is blurred, resulting in this field being heavily flawed. A significant part of the issue in this profession can be combated by proper education, training, and skill competencies. Reconstructing this field should start with the first step of ensuring nurse competency. While nurses have the option to attain the Certified Aesthetic Nurse Specialist (CANS) certification, not all facilities that offer non-surgical procedures require this; this deters registered nurses from striving to obtain this. The CANS certification encourages registered nurses to further their education and requires recertification every three years. Forty-five hours are required to recertify; two must be strictly

dedicated to patient safety. Earning this certification serves in a multipurpose sense: it ensures nurse competency, strengthens the professional relationship between the patient and the nurse, and increases patient safety. The patient is more inclined to trust that the registered nurse is highly knowledgeable and is confident in their skill. The CANS certification also decreases the amount of error in this field. Due to this reason, this should be mandatory for all nurses seeking to enter this field.

Moreover, exposure to this nursing field early on will allow nursing students to explore this area and acquire foundational skills. Designing nursing programs for students to experience a two-part specialty course will expose them to resources. Offering students the ability to pick a course in specialties that are carried out in clinics can broaden pathways new-graduate nurses may want to take. Nursing school boards should implement this practice in nursing programs globally to instill confidence in the new graduate nurse for whichever route they take. With aesthetic nursing becoming a more sought-out field, the nurse going into aesthetics should understand the various procedures offered in the specialized course in nursing school. There is always room for development in this field of nursing.

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EXAMINING THE EFFECTS OF ORGANIC FERTILIZER ON BONE, STONE, AND CERAMIC ARTIFACTS

Throughout the Southeastern United States there are vast expanses of agricultural fields, creating a patchwork quilt of corn, peanuts, cotton, and many other varieties. As a child often taken on road trips to other parts of Georgia, my eyes often fell to the landscape outside the car. Rows of unidentifiable plant material fell away as the car moved on, leaving my imagination to wonder what exactly those fields held. Years later, that childlike wonder has taken on a more academic lens, wondering not what lies in the field, but what lies underneath the soil. What did prior landscapes look like? Were they agricultural fields? Were they forests? Were there communities of people dotting the landscape? What signs of people that have inhabited this area remain unseen, undiscovered amidst the red clay? Each successive layer peeled away provides a view of a different landscape's surface, much like peeling away layer after layer of an onion. My mind often wanders along the lines of these old landscapes, wondering what they were like and what their soils contain.

Archaeological sites are often encountered in the agricultural fields in the Southeastern United States because the arable land today was also productive land in the past, leading people of both past and present to choose the same areas for food production. Because artifacts are often present in the plow zone—a stratigraphic layer near the topsoil—agricultural practices like plowing across fields often leads to the discovery of archaeologically significant sites because it disturbs the matrix, bringing previously buried artifacts into farmer's hands. While this generates new sites to examine and study, these practices should be considered harmful because the heavy machinery used in many agricultural fields can have a significant impact on the sites and their associated artifacts. In a best-case scenario, these machines are disturbing the spatial (both horizontal and vertical) contexts, further skewing the analysis of these sites. In the worst-case scenarios,

these machines are breaking artifacts, exacerbating the damage done by bioturbation and anthroturbation. Depending on the soil makeup, grain size, and hardness of the earth, the artifacts can be exposed longer to the effects of trampling by humans, goats, bovine, and larger animals (Driscoll et al. 2016; Erin et al. 2010; Gifford-Gonzales et al. 1985; Marwick et al. 2017; Pargeter and Bradfield 2012; Shipman 1988). While plenty of research has been done on the horizontal and vertical spatial disruption or the fracture and breakage patterns caused by biological beings, there has not been research conducted that addresses the effects of heavy machinery (commonly used in large-scale agriculture) on the breakage patterns or displacements that have been shown to occur.

Fertilizers are commonly used to increase the health and yield of plants, and their effect on the surrounding environment has prompted studies from ecologists (i.e., Elswick and Gerke 2013; Giannakis et al. 2021; Mishra et al. 2013). Studies have begun to discover the importance fertilizer runoff into watersheds, but there has been little to directly address the buildup of fertilizers within the soil (ex. Schaefer and Alber 2007). A fertilizer's effectiveness relies on its ability to interact with the organic matter within the soils, and many of the mineral or chemical fertilizers have three major components: phosphates, nitrogen, and potassium (Chaves 2005; Giannakis et al. 2021; Mishra et al. 2013).Organic fertilizers are becoming an alternative to chemical fertilizers in an attempt to significantly reduce the amount of chemical fertilizers used, ultimately to solve the environmental issues caused by the chemical fertilizers (Trujillo-Tapia and Ramírez-Fuentes 2016). Organic fertilizers, such as bone meal and blood meal, are insoluble in water while retaining the key nutrients within the soil which has the potential to create buildup within the soil until the plants draw the appropriate nutrients from the fertilizer. Biofertilizers, made from organic materials, are becoming

a popular subject of study because they are being recognized as a potential alternative to the conventional chemical fertilizers (Gomes de Almeida et al. 2021; Jeng et al. 2006; Mishra et al. 2013; Ramírez-Fuentes 2016; and Trujillo-Tapia and Ramírez-Fuentes 2016). This buildup is rarely discussed in the literature, and even more rare: an interest in managing this buildup.

Despite the expansive knowledge regarding the chemical, physical, and ecological understandings of fertilizers, there have been no studies that directly address the possibility that bone, stone, and ceramic artifacts are being affected by those fertilizers. This leaves a glaring void of knowledge regarding what happens to artifacts after they are deposited in the archaeological record. Effects of the outside matrix have become the topic of investigation for multiple experimental archaeology studies, covering bioturbation in a variety of sizes from livestock trampling to anthroturbation down to artifact displacement by earthworms (Driscoll et al. 2016; Erin et al. 2010; Gifford-Gonzalez et al. 1985; Marwick et al. 2017; Olsen and Shipman 1988; Pargeter and Bradfield 2012; Schiffer 1983; Shipman 1988; Stein 1983). These subsoil changes in and after the sites are formed force archaeologists to change their approach to interpretation. This study seeks to determine if fertilizers influence the condition of artifacts, and if there is an effect on the artifacts, how extensive is the effect for each artifact type. To account for each of the material types being evaluated, three hypotheses were created:

H_1: *The organic fertilizer will create etching on bone.*
H_0: *The organic fertilizer will not create etching on bone*

H_2: *The organic fertilizer will create etching on the surface of the ceramics*.
H_0: *The organic fertilizer will not create etching on the surface of the ceramics.*

H_3: *The organic fertilizer will create minimal to moderate damage on the stone.*
H_0: *The organic fertilizer will not create damage to the stone.*

BACKGROUND

While organic fertilizers are not new, their increased application creates a new branch of scientific inquiry for experimental archaeologists. Part of this increased application happened in the 1990's as legislation created the National Organic Program within the United States Department of Agriculture (Plattner et al. 2008). There have been no studies that primarily address the effects of fertilizer on artifacts, but archaeologists have examined other characteristics of human and animal impacts, site formation and soil indicators, and modern agricultural practices. To appropriately design a

test that addresses some of the major materials found in the archaeological record, additional research in ceramic studies, lithic use wear analysis, and bone analysis were drawn upon to design the samples while studies that discuss site formation, bioturbation and anthroturbation, and agricultural studies were chosen for their insights into the methodology.

Experimental archaeology, a material science that merges laboratory experimentation with the actualistic interpretations of true archaeological material (Outram 2008; Saryada and Shimada 1973; Skibo et al. 1989). Experimental Archaeology does not aim for reconstructing the past (Outram 2008), or only serve as auxiliary data (Saryada and Shimada 1973), but culminates in determining the ways in which material goods can serve social and ideological function through their specific uses (Skibo et al. 1989).

Experimental archaeology has also changed over time, just as archaeology has evolved and improved. This particular approach to archaeology has been of interest since the 1800's, although the early attempts were considered individualized moments as opposed to the wildly interconnected pathways that we now recognize experimental archaeology to be (Carrell 1992). The earliest attempts at trying to recreate artifacts happened in the mid- to late 1800's with Sir John Evans, Augustus Pitt-Rivers, Robert MacAdam, and others (Carrell 1992). Experimental Archaeology was popularized in the 1950's with other authors; Evans, attempted to replicate stone tools and the processes involved in hafting them. Peter Glob, Peter Reynolds, and Hans Hansen each created replica wooden ploughs to try to better understand the effort necessary for food production (Carrell 1992). These early experimental studies began to prove the need for experimental archaeology to become a more prominent aspect of archaeology because it can help bridge the gap between the ethnographic data that illustrates the steps of the process with its ties to behavior and the archaeological data that generates the tangible evidence of what past individuals have chosen to create. This process, described by Binford (1965) and later Schiffer (1998) as middle range theory, as a theoretical framework wherein the units of culture can be broken down and examined as empirical data that can be used to discuss the larger social trends and high-level theories. Being able to tie together the larger discussions of larger social changes to the more immediate signifiers of cultural change on a site-by-site basis generates deeper insight into the ways that social changes can be seen in the archaeological record.

Carrell (1992) argues that the most significant aspects of experimental archaeology are twofold: first, experimental archaeology addresses questions of subsistence or technology, and second, it tests the validity of theories regarding assumptions about human behavior that are reflected in the archaeological record. Carrell (1992) is not alone in this approach. Pargeter and Bradfield (2012) also argue that experimental archaeology should focus

not on a single artifact but use whole assemblages in order to establish a series of related observable outcomes from pre-established conditions that can be replicated. Others state that a hypothesis is what drives testing in experimental archaeology, where progress is determined by the acceptance of the null hypothesis which in turn prompts more experimentation (Outram 2008).

Much of modern experimental archaeology benefits from ethnoarchaeological research: research utilizing ethnographic methods to identify the details of production and directly testing the results against experimental materials: a process that archaeologists at large seek to understand, and experimental archaeologists seek to be able to recreate (Rots and Williamson 2004). Rots and Williamson (2004) used ethnoarchaeology to compare archaeological assemblages with the tools made by indigenous people. Their study focused on the analysis of the techniques used in microwear and residue analysis to determine the impact of burial on the preservations of residues (Rots and Williamson 2004). Ethnographies and experimental archaeology can offer insight into the decision-making processes, an intangible but vital aspect of understanding how artifacts are found, made, used, and discarded.

Experimental archaeology is no longer the isolated and individualized study it once was, and progress should utilize more and varied sources of information in order to expand the applicability of the research being done. Experimental archaeology has a broad range of topics, covering studies that examine the effects of bioturbation to understanding the polishes and other signs of use-wear present on various material types. This study will be drawing from the methods of many of these prior studies to guide the production of the bone, stone, and ceramic samples before their submersion into the bone meal.

All human activity impacts the soil around us. Even in areas where there are little to no visible middens or mounds or large earthworks, inhabited areas can still produce traces of human activity. Phosphorous is one such indicator of human activity. Higher concentrations of phosphorus suggest a high concentration of people (Holliday and Gartner 2006; Wells et al. 2000). But soil sciences have come a long way in measuring the amount of loose phosphorus in the soil as a result of the byproducts of being human. Phosphorus can enter the soil as a result of much of what humans interacted with on a regular basis: human waste, animal waste, ash, bones, and other organic material (Holliday and Gartner 2006). When phosphorus enters the soil, it most commonly is grouped into a phosphate, a grouping of molecules that is resistant to oxidation, reduction, or leaching that would breakdown or carry away the extra phosphorus (Holliday and Gartner 2006). This creates a buildup in the soil, sometimes to incredibly significant amounts that allow

archaeologists to identify middens before the excavation begins (Wells et al. 2000). Because of the stability of the phosphates in the soil over time, it is a useful tool across several distinct types of environments and across continents. However, Phosphorus is not the only element indicative of potential human habitation. Nitrogen also plays a key role in anthrosols, alongside several different heavy metals (Wells et al. 2000), but more studies have addressed the presence and concentrations of Phosphorus. The continued inhabitation and use of a space allows for regular amounts of Phosphorus to build up within the soil until it is affected by site formation processes. Site formation processes like those that Schiffer (1983) discusses influence the way phosphorus can fix itself into soils, redistributing it across the sites, or even removing some phosphorus from the soil (Holliday and Gartner 2006). However, in significant enough amounts, even these small effects cannot completely remove all of the phosphorus generated by humans and the environment they interact with, giving archaeologists an extra clue to the presence of archeological sites. Such high but unwieldy concentrations of phosphorus are also a boon to farmers, adding another potential layer to the complexity of soils. In the Amazon region, William Balée (2006) has noted that indigenous societies have established different uses of forest based on their prior interactions and use by humans. Most of Balée's (2006) work establishes which forests could prove to be useful as agricultural fields because of the increased phosphorus content. The indigenous societies keep careful track of the ways which areas have been used before by other humans, drawing on the history of the area (2006).

The chemical and geological makeup of the soil is not the only aspect of soil that interests archaeologists. Accumulation rates and settlement patterns also interest archaeologists because sedimentation rates change over time and as the intensity of occupation fluctuates (Stein et al. 2003). Archaeologists can analyze the layers of sediment and artifacts in order to determine the depositional timeframe for cultural deposits (Stein et al. 2003). Understanding accumulation rates can even translate to calculating the length of time that a site has been occupied, how many people lived at one site, or even how long ago the site was occupied. These changes in the soil buildup can also be used to determine the geographic limitations of the site. Such important distinctions have become integral aspects of determining the fundamentals of a site, which then become even more significant in the interpretation and analysis of these sites. These fundamentals rely on the transformation, spatially, quantitatively, and relationally. By applying analysis of the depositional trends, archaeologists gain valuable insight into the patterns of human behavior that influences the rate of deposition (Schiffer 1983). Despite the long strides made to better understand the way that that soil composition can aid archaeology, there is surprisingly little

application of this in a larger context.

In order to best understand how settlement patterns and artifacts become surrounded by the matrices and enter the archaeological record, archaeologists must also evaluate the natural and cultural formation processes present in archaeological sites (Schiffer 1983). Natural formation processes include the geological processes and physical ways in which the artifacts enter a matrix, such as earthquakes, mudslides, erosion, sedimentation, and more. Cultural processes are much more varied and can range from the accidental loss of a tool to the intentional internment of goods in a ceremonial context (Schiffer 1983). Such processes involve people interacting with the spaces around them and can be traced to the upkeep of space too, influencing the places where artifacts that are purposefully discarded versus the places they are accidentally discarded. Cultural processes also include trampling and plowing, which have significant impacts of vertical and horizontal displacement of artifacts.

While there have been no studies that directly address the exposure to chemicals in the soils that artifacts might face once they enter into the archeological record, there have been several studies that address other factors that affect the archaeological matrix. Even things as simple as humans repeatedly walking over the ground can create spatial displacement significant enough to need further study in order to understand the impact that anthroturbation has on the land (Driscoll et al. 2016; Gifford-Gonzales et al. 1985; Marwick et al. 2017). One of the commonalities of these studies is that all of the authors have noted that people walking over soils has the capacity to disturb both the horizontal and vertical placement of artifacts within the boundaries of the site, with some on the surface even leaving the study area after being kicked.

Even more extreme than the anthroturbation is the bioturbation that occurs as a result of larger animals like goats, cows, and buffalo (Eren et al. 2010; Pargeter and Bradfield 2012; Shipman 1988). Several studies have found that there is more severe horizontal and vertical displacement from the larger animals. But trampling is a more complicated phenomena than one would assume. These trampling studies involve everything from the types and number of animals and people involved to the number of passes made down to the grit of the soil, all of which can change the outcome of these trampling studies. One of the more common effects of lithic flakes being subjected to trampling is reoccurring edge damage (Driscoll et al. 2016; Marwick et al. 2017; Pargeter and Bradfield 2012). There are several explanations with trampling studies that also help explain the why the edge damage occurs in such consistent patterns, the first being that the edges are thinner and more fragile, making them more likely to fracture as they are ground against sediment particles, rocks, or even the hooves of the animals

(Driscoll et al. 2016; Gifford-Gonzalez et al.1985). These studies conclude that the microfractures do not have a significant impact on the interpretation of the use-wear analysis that the lithics undergo after being discovered and excavated (Driscoll et al. 2016; Eren et al. 2010; Gifford-Gonzalez et al. 1985; Markwick et al. 2017; Pargeter and Bradfield 2012). It is important to note any changes to these lithics that occur in the external environment that could influence interpretation. If there are post-depositional changes to the lithics that can be accidentally attributed to human involvement, then the markers could be wrongly interpreted as use wear. These potential false positives can skew the interpretation of sites. Even on a smaller scale, these false positive can change archaeologists' perceptions of the how tools were used, changing the way we look at tool use spatially or temporally.

While we have some understanding of the effects of trampling and the damage it causes, we understand little about the other ways in which the artifacts are affected by their time in soils. If the damage from exposure to organic fertilizer is significant enough, then the methods we use to interpret the distinctive markings from the patterns of use-wear that are already well documented need to be adjusted in order to compensate for this damage. Several archaeologists have studied use-wear patterns under microscopes, measuring the reflectivity of flakes in order to better understand the development of polishes (Ibáñez et al. 2012, González-Urquijo and Ibáñez-Estévez 2003). Lithic polishes are not the only sign of use wear available for study. Microwear methodology also includes examinations of edge damage and microflaking. There are specific markers (step bending fractures, unifacial spin-off fractures, bifacial spin-off fractures, and impact burination) that can also be used to identify use wear patterns (Pargeter and Bradfield 2012). Another study, run by Driscoll and colleagues (2016), noted that the overall breakage patterns have no discernable associations between size and weight and the occurrence of breakage of both the quartz and chert. Many of the breaks that occur in Driscoll and colleagues' (2016) study are bending fractures or radial fractures. Only 10% of the chert samples showed distinct signs of retouching flakes and only 1% of the quartz samples that showed signs of retouching.

Lithics are not the only artifact type vulnerable to the effects of trampling. Even the exterior of bones face weathering from exposure to the shifting soils. Shipman (1988) specifically studied the distinctly different fracture patterns and the differences brought about as the result of hunting and butchering in comparison to the types of fractures brought about by trampling. They found that there was a clear difference between the two types of fractures, with the trampling fractures being more numerous but smaller in scale. In other studies (Byrd 2011; Stiner et al. 1995), bone samples were assessed to identify both the bones and the marks used to make them

after a variety of conditions. They aimed their study at the methodology and determining the difference between fractures made from the formation and use of bone tools and the fractures that occur as a result of trampling.

Ceramics have also been of interest to experimental archaeologists, focusing on the performance characteristics between different tempering agents which can vary from organic to inorganic. Within the Southeastern United States, several different temper types are common. Experimental archaeologists have spent considerable time devoted to the strength testing of different tempers, quantities, and firing temperatures. This type of qualitative data allows archaeologists to infer some of the reasons involved in the decision-making process or changes in trends in the archaeological record (Lawres et al. in review). Since strength testing (Feathers 1989; Müller et al 2010; Skibo et al. 1989) and thermal shock testing (Bronitsky and Hamer 1986; Müller et al. 2010; Skibo et al. 1989; West 1992) have become significant areas of study, the methods utilized in making the test samples become standardized. Bebber's (2017) ceramic study builds off the previously established methodology and utilizes flat ceramic briquettes in a uniform shape and size so they are easier to assess in a three- or four-point strength test. Other archaeologists offer other insights into the testing methods on a broader scale, discussing the methods overall and the ways in which these methods adhere to the goals of experimental archaeology, and can be utilized for greater effect (Bebber 2017; Carrell 1992; Hein et al. 2008; Kilikoglou et al. 1998; Lollis et al. 2015; Neupert 1994; Skibo et al. 1989; Tite et al. 2001; West 1992). Untempered ceramics are generally stronger than many other types of temper, but that is assuming that there are not changes that happen to the ceramics after they enter the ground (Skibo et al. 1989). There is the possibility that being exposed to the chemicals in organic fertilizer could impact the overall strength of ceramics. This study will specifically address the impact on ceramics that organic fertilizer might have.

While there are no archaeological studies that address the effects of fertilizer, there are agricultural studies that do address the benefits and limitations of organic fertilizer, especially bone meal. Agriculture must be flexible in order to keep up with the increasing demands of a growing population and land that is becoming more tainted by the long-term commercial use of the chemical fertilizers and regulations. Rising populations across the world have driven farmers to seek out methods that will generate a greater field yield (Mishra et al. 2013; Trujillo-Tapia and Ramírez-Fuentes 2016). This search once led to commercial chemical fertilizers, which have proven to be only marginally helpful in increasing crop yield temporarily while also leaching other nutrients out of the soil and killing nitrite-oxidizing bacteria that would otherwise help fix nitrogen to

the soil for plant use (Trujillo-Tapia and Ramírez-Fuentes 2016). However, these chemical fertilizers were not the only products being applied to farms.

In the wake of the Mad Cow Disease outbreak, farmers were forced to repurpose much of the bone and blood meal they had used on meat producing animals, so many farmers chose to add it to their crops (Chaves et al. 2005; Jeng et al. 2006). While these soil additives are not new to the United States, they offer a more effective source of phosphorus, potassium, and nitrogen, allowing the plants to more easily absorb the nutrients for healthy growth (Chaves et al. 2005; Gomes et al. 2021; Jeng et al. 2006). Both the commercial grade chemical fertilizers and the organic fertilizer share these major components, driving the conversation about the better product into a discussion about the effectiveness of these biofertilizers. They are capable of not only interacting with the soil to draw out more of the nutrients already stored in the soil, but they are also capable of adding to the quantity of nutrients, which further increases the yields. The effectiveness of the biofertilizer suggests that less volume of fertilizer is necessary, further reducing the costs to the local ecosystems and farmers.

Gomes and colleagues (2021) studied biofertilizers used in fertigation—leaving the fertilizers in a liquid state that could be added to the irrigation lines. Their research used rice bran and molasses as the base feed for the microorganisms, with each sample set adding either castor bean cake, blood meal, hoof and horn powder, and bone meal. Each set of biofertilizers were then allowed to ferment and then evaluated for their nitrogen, potassium, and phosphorus content. Bone meal biofertilizer, the substance used in this experiment, had the lowest concentration of nitrogen, but this is due to the amount of nitrogen already available in the bones before the fermentation. Gomes and colleagues (2021) note that the nitrogen content available before the fermentation process is not always indicative of the final nitrogen amounts. The blood and bone meal, which had a relatively low amount of nitrogen before processing ended with a slightly higher amount after the fermentation process (1.4% up to 1.9% bone meal: 1.5% up to 2.0% blood meal nitrogen content). Blood meal and bone meal both generate a continuous growth in the amount of nitrogen present in the samples. Despite the stable growth, the bone meal had the lowest nitrogen content. The blood meal had a slightly higher concentration of nitrogen, but Gomes and colleagues (2021) argue that this is due to the higher initial content. Of all of their samples, the hoof and horn powder had the highest raw nitrogen content 6.8% at the end of fermentation cycle. (Gomes et al 2021).

Sustainability worries have become more prevalent in the wake of climate concerns. In climates where drought and heat are having a more significant effect on plants, the University of Georgia and the University of Florida have studied the costs of developing and maintaining a field of drought-resistant

blueberries under the regulations and requirements to be certified as organic (Plattner et al. 2008). This study aimed to determine if growing organic produce could be done in an economically and environmentally sustainable manner. Part of the study also addressed larger concerns by farmers who want to switch to a more organic style of farming using natural biofertilizers but had concerns about the market availability for organic products. If long-term organic farming can be proven as profitable for the growers and the consumers, then this may prompt a larger trend towards organic farming, especially if biofertilizers can increase yield size more efficiently and for longer than the commercial chemical fertilizers.

Agriculture is a changing and growing field and making the switch to biofertilizers offers significant boons to farmers, but with the complexity of these biofertilizers, there also comes the unknown effects of fertilizers and how they interact with the various types of materials found in the archaeological record. This study aims to evaluate the effects of these fertilizers on replicated material commonly found in the archaeological record.

METHODS

In order to effectively evaluate the effects of that fertilizer has on the materials found in the archaeological record and how they are affected by exposure to organic fertilizer, it is necessary to create samples of each major type material type: animal bone, stone, and ceramics. The best way to directly examine the effect is do directly submerge a sample of these materials into organic fertilizer. This study utilizes bone meal as the organic fertilizer. In order to compensate for any potential anomalies from individual types, four types of rock samples, three types of animal bones, and one type of ceramic briquette were used. Each sample was imaged using a FEI Quanta 200 Scanning Electron Microscope (SEM) in the University of West Georgia Geosciences program's microscopy laboratory. While the larger processes used to image each of the samples is consistent, each material type required different preparation methods.

While this study is generating photographic data from the SEM, the purpose of this study is to determine the effects of the fertilizer on stone, bone, and ceramic materials. In order to test the effects, each sample was exposed to four cycles of submersion into a slurry of bone meal mixed with tap water. To ensure consistency and remove the possibility of accidental damage, each sample was individually placed in a 250mL beaker and surrounded by a mixture of 50mL of bone meal and 33mL of water. The mixture was stirred thoroughly into a pudding-like consistency. As a result of the consistency, it may be necessary to gently apply pressure to the samples into the bone meal and spread the fertilizer over the top of each sample and ensure that each side is equally covered. For each cycle, the samples were left for 120 hours

(5 days) before being removed, rinsed with tap water, and gently rubbed with a gloved hand. No other tools were used to clean the samples in order to prevent accidental modification of the samples.

Only one side of the samples was imaged, and in order to maintain which side of the sample was imaged, a small arrow pointing to the imaged side, along with sample number and orientation guides, was drawn on each sample in permanent marker. For each sample, a sketch of the shape of the sample was drawn, and the two sections of the sample that were imaged were recorded. Each sample was imaged in two separate places, but also at two separate magnifications for each section that was sampled. This study used a scale of 500mm and 50mm for magnification. The magnifications fall within the range of 66x-113x magnification for the 500μm and 568x-1038x magnification. There is some variance here with the magnification because it has to be manually adjusted.

Four different types of stone materials were used: Obsidian, Dacite, Keokuk Chert, and Texas Flint. Each portion of rock was cut into several strips using a Barranca Diamond Slab saw, then were further cut into smaller segments (see Table 1) using a trim saw, and then polished with three different silica carbide grit types: 200, 400, and 600. Polishing each surface limited the amount of light that would refract and distort the image or the capability to examine the stone samples for differences (González-Urquijo 2003). González-Urquijo (2003) primarily utilizes the luminosity of the polishes compared to the unworked stone in order to establish types of materials. While González-Urquijo (2003) used photographic analysis and comparisons of the polishes in order to determine use wear analysis. Here, the methods are similar in function; this study focuses on assessing the damage (if any) caused by repeated exposure to the bone meal using photographic analysis.

Table 1. Dimension of stone samples (mm)

	T Flint 1	X	Keokuk 1	Dacite 1	Obsidian 1	T Flint 2	X 2	Keokuk 2	Dacite 2	Obsidian 2
Length	27mm	19mm	16mm	16mm		20mm	25mm	26mm		14mm
Width	17mm	14mm	15mm	8mm		13mm	10mm	13mm		8mm
Height	11mm	9mm	7mm	9mm		9mm	9mm	10mm		9mm

White-tailed deer (*Odocoileus virginianus*), turkeys (*Meleagris spp.*), and red-eared pond sliders (*Trachemys scripta elegans*) are common

animals in the Southeast currently and in the archaeological record. Because of this, these species were chosen for this study. The deer metapodials were first cut down into cross-sections, but then had to be cut horizontally in order to fit into the SEM test chambers. Deer Sample 1 was 20mm long and 13mm wide; Deer Sample 2 was 18mm long and 12mm wide. The turkey legs were also cut into cross-sections but were small enough that they did not need to be cut horizontally. Turkey Sample 1 measured 21mm long by 10mm in diameter; Turkey Sample 2 is 22mm long and 8 mm in diameter. Since the turtle shell acquired had the plastron and carapace attached, it had to be separated before the plastron could be cut into flat samples for ease in mounting the samples into the SEM. Both turtle samples were made from the plastron and cut down to 27mm x 28mm and 30mm x25 mm for the first and second samples, respectively. A hacksaw was used to cut each of the bone samples down to their measurements.

The ceramic test briquettes used were made from dry-screened Lizella clay and contained no temper. Untempered briquettes have been used to establish a baseline in many temper studies and serves as the baseline in this study in order to prevent any anomalous differences as a result of temper additives. The clay and water were mixed together on a cloth-covered wedging table in order to create a workable clay body. The clay was then rolled out between wooden guide rails 11mm in height until the entire clay body was compressed and elongated consistently. Briquettes were then cut using a wooden template measuring 100mm x 20mm x 11mm. After the briquettes were cut, the briquettes were set aside to dry for 72 hours. This left the briquettes in a firm, leather-hard state before the firing process. The briquettes were fired in a Bartlett Model 3K AIM 64KD test kiln. During the firing process, the briquettes were heated through two heat phases: the first to evaporate any remaining water and the second to completely harden the ceramic. The first round of heat increased in 10°C (50°F) increments per hour up to a maximum heat of 90.5°C (195°F). Once the kiln reached that temperature, it was programed to keep the temperature consistent for 8 hours before starting the second round of heating. The kiln increased the temperature through a second heating rate of 65.5°C (150°F) per hour, with the final temperature of 700°C (1292°F). This temperature held for 2.5 hours after reaching that maximum temperature. After the 2.5 hours, the kiln shut off, allowing the briquettes to cool without concern for thermal shock (Lawres et al. in review).

After the briquettes were removed from the kiln, they had to be cut down in order to fit inside the SEM. Both samples used in this study were from the same briquette in order to ensure consistency after establishing that there was no need for multiple briquettes in order to satisfy the sample size. The briquette was cut down from the total length (100mm) to 30mm

in length using a Wen 2305 Rotary Tool and a thin, flat Dremel bit while the other two dimensions, width and height, remain unchanged.

After each type of sample was created, each sample had to be prepared to be put in the SEM. Inside the imaging chamber is a mounted platform where the sample disc slots in. Individual samples are mounted to the sample disc using temporary adhesive dots, then clean gently with isopropanol, wiped with a paper fiber optic cleaning wipe, then rinsed with deionized water and dried with the wipes again. The only test sample not cleaned in such a manner was the ceramic, due the porosity of the sample and the potential for it to absorb the isopropanol. These samples do not have any significant traces of metals in them, which makes them relatively nonconductive in the SEM. Standard practice when sampling nonconductive material is to coat the sample in metal to improve the conductivity (R. Currier, personal communication 2022). However, because this study is specifically examining the surfaces of these materials, no coating was used. In order to account for the lack of conductivity, the environmental (ESEM) setting was used, which requires a high voltage (15.0kV) in order to produce the image (R. Currier, personal communication 2022).

The SEM uses a high current run through a filament (1.86V) to generate the electrons which are then shot down the barrel at the sample. This study used the backscattered electrons (BSE) in order to generate the image, rather than the secondary electrons that generate images when examining material with a higher conductivity. As the current passes through the filament, it can fluctuate some, but the range of emission current ranged from 91-102μA, which is within the normal range of variance (R. Currier, personal communication 2022). This range has no impact on the images.

RESULTS

The images of each sample after each round of sampling provides visible changes under both the 50μm (66-113x) and 500μm (568x-1031x). The most significant changes are visible at the 500μm level, where some of the samples across different types have obtained significant enough damage to the point where finding the zoomed placement becomes increasingly more difficult— even impossible under certain conditions. In cases where the original segment could not be identified, other, similar segments of the samples were chosen for their similarity to previously observed areas. For the purposes of this experiment, surface modification includes pock marking, microcracking, and changes in the surface topography.

Bone

The bones showed the most significant deterioration from the fertilizer, with visible differences beginning after the first submersion cycle. Such changes include general surface modification, and changes in the

surface topography. In some sample images, there is also pock marking, where there appears to be more change across a smaller surface area when compared to the rest of the surrounding area. While each of these are present in differing concentrations, all bone types have significant deterioration on them. There were also several other visual changes that occurred across all bone types. The permanent marker on all three types of bone samples looked faded after each cycle in the fertilizer. This effect was not present on any of the stone or ceramic samples, where the permanent marker was unaffected by the exposure to the fertilizer.

Deer
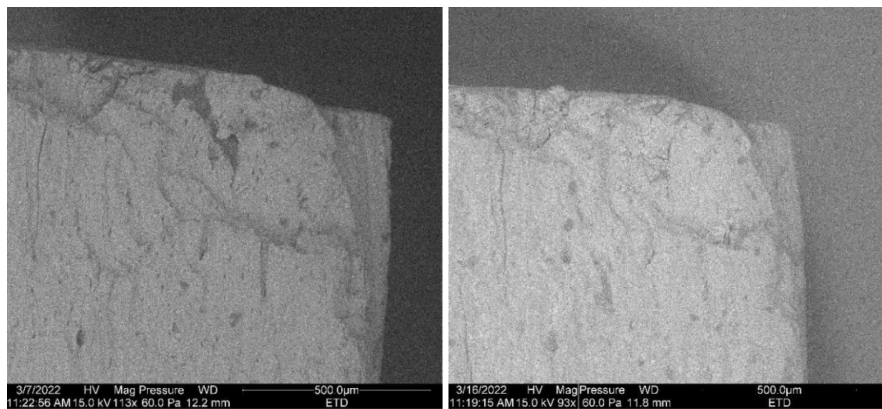
Figure 1. Deer Sample 2A. Left: before first submersion; Right: after first submersion.

The deer samples were significantly affected by the fertilizer, creating several different textural differences, seen in the disappearance or appearance of darker shaded areas. The most significant visible damage can be seen in the rounding of the edges in Figure 1. There is also a visible difference in textures, with the edges of already existing damage developing further. These places where the damage occurs have less defined edges, corners, and angles. The microcracking visible alongside the left portion of Figure 1 appears to have increased in length of the course of the submersions. In the center of the image is a gray, lightly shaded area not present in the left image but present in the right, showing that the damage is not contained to the portions of the bone that already have damage to them. There are several circular holes that develop along a crest of the bone surface visible in the later image that are not present in the first image, further proving that the damage is not limited to one specific portion of the bone.
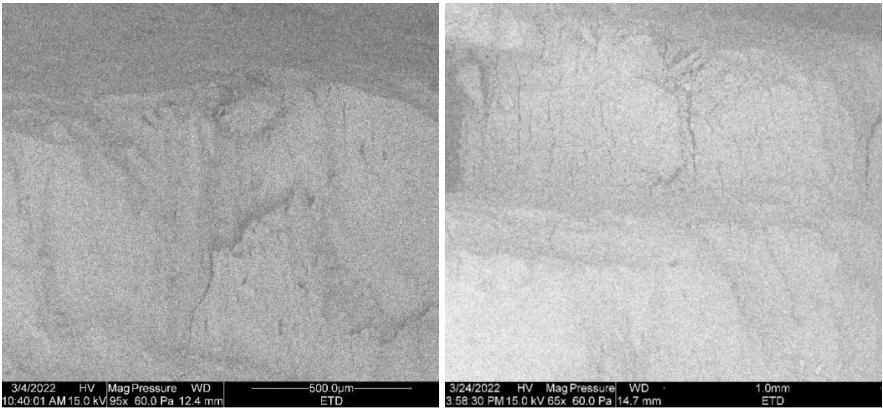
Turkey

Figure 2. Turkey Sample 1A. Left: before submersion; Right: after fourth submersion.

The turkey samples were difficult to image because they did not have a flat surface on which to securely fix the samples when inserting them into the SEM because they tend to roll even with the adhesive dots. This was a chronic issue, further increasing the difficulty in identifying the same places on the sample to be imaged. Once each sample was oriented correctly for imaging, the turkey bone samples show some change over the course of the submersion cycles, but not to the same extent that the turtle or deer samples changed. While the deer bone shows significant pock marking, the turkey bones had more overall deterioration, where the edges of the sample do not appear to be the same edges as before. See Appendix images for the Turkey Samples 2A, where the difference between the top right image and the bottom left image (post 2nd round of submersion and post 3rd round of submersion, respectively) are from the same place on the sample, but do not appear to be the same segment under the initial inspection, but after further examination, they are the same piece. Overall, the turkey bone segments deteriorate faster than the deer bone do, developing smaller changes in the surface topography.
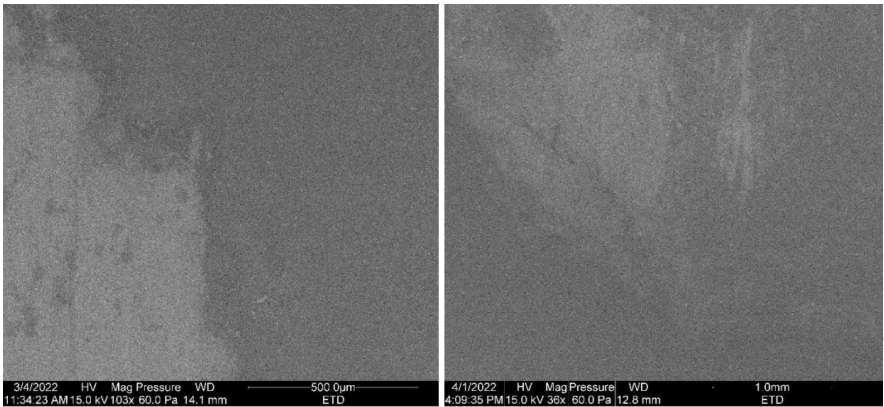
Turtle

Figure 3. Turtle Sample 1A. Left: before submersion; Right: after fourth submersion.

The turtle samples were most affected by the exposure to the fertilizer, to the extent that identifying the same positions was very difficult at the lower level of magnifications (66x-113x), but especially at the higher level of magnification (568x-1031x). Identifying the same positions on closer magnification became even more difficult because the fertilizer eroded the edges of the turtle plastron to such a significant degree that identifying the places previously imaged was the hardest of the samples to image after the submersion. This is due in part to the layering of the bone in the turtle shell, where the exterior layer faced more damage than the other layers underneath. As the subsequent sections of bone were revealed by the damaged layers above it, those layers were in turn also degraded.

Even without the microscope, there is visible damage to both Sample 1 and 2. The outermost layer of the plastron began to peel away from the rest of the bone sections. This difference is especially noticeable after the samples have dried and the exterior became separated and flakey. After allowing the turtle bones to dry, the exterior most layer of platron began to not only get brittle and extremely fragile.

Stone

The stone samples showed the least significant deterioration as a result of exposure to the fertilizer. Most of the places where the damage occurs are in parts of the stones where there were imperfections in the stone or in the crevices where the fertilizer can build up. Between each of the sample types, there is a consistent amount of deterioration, even while it presents differently across the samples.
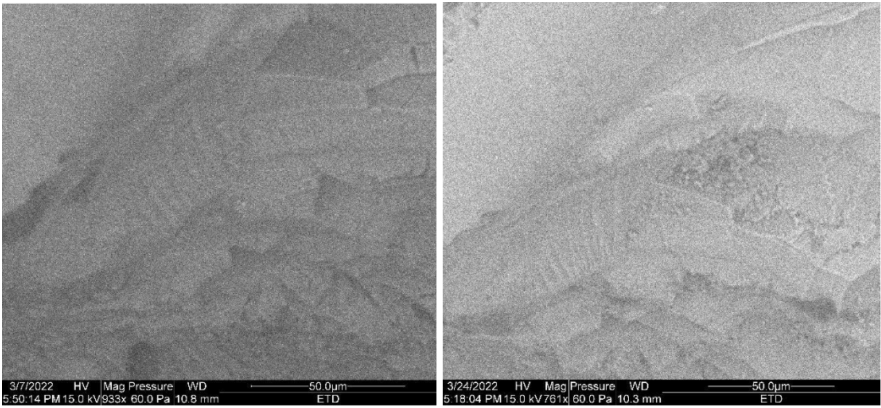
Obsidian

Figure 4. Obsidian Sample 1B. Left: before submersion; Right: after second submersion.

While there are some visible differences visible at lower level of magnification (66x-113x), most of the change is visible at the higher level of magnification (568x-1031x). In these samples, there is an increase in the amount of surface topography changes that can be seen. In Figure 4, there are several smaller segments where the change is more noticeable. Across the flat surfaces of the obsidian samples, the texture and topography of the surface of the obsidian was uniformly affected by the bone meal. However, the unevenness on the edges of the flakes creates crevices in which the bone meal can accumulate. Most of the more significant changes to the samples occur in areas where the crevices are, reducing the edge lengths, softening the angles on some of the edge breaks, and expanding the depths around the flake scars/striations. In several of these images, the fertilizer is visible as grainy pockets because the cleaning process was minimal in order to not create accidental wear. The uneven surface creates uneven deterioration across the surface, leading to exaggerated edges and changes in the surface of the stone.
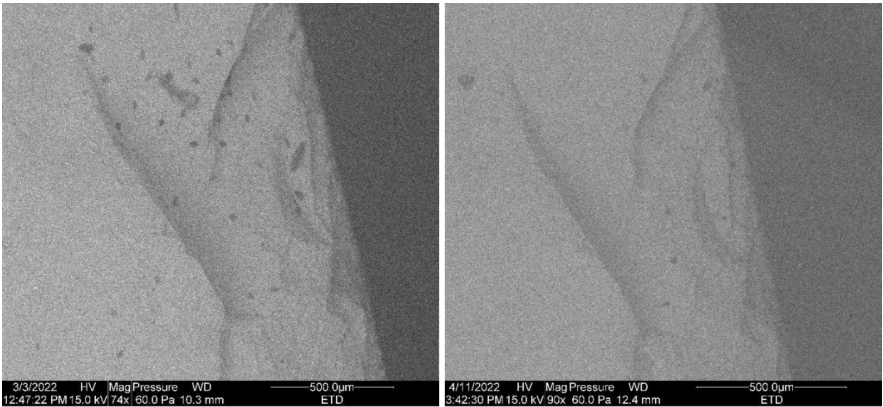
Dacite

Figure 5. Dacite Sample 2B. Left: before submersion; Right: after fifth submersion.

The Dacite samples developed less surface topography than the obsidian. While the fertilizer did not significantly impact the homogenous portions of the Dacite, it further degraded the several impurities present before the first submersion at the 500μm range to almost none by the end of the fourth submersion cycle. At the closer magnification, there does not seem to be a significant difference in the depth of the flake scars or edges. There are still several small white segments that are present in all five images except where the remainder of the fertilizer has accumulated (see appendix Dacite Sample 2B Zoomed for the gradient of pock marking).

In much the same way that the edges softened on the bone samples and the obsidian samples, there is also a softening of the edges on the Dacite as well. In the image on the right, some of the definition has been lost in the semicircle near the right side of the image. There has also been the development of a darker shadow near the left side of the same image that is not on the right side, further proving that pock marking is taking place.
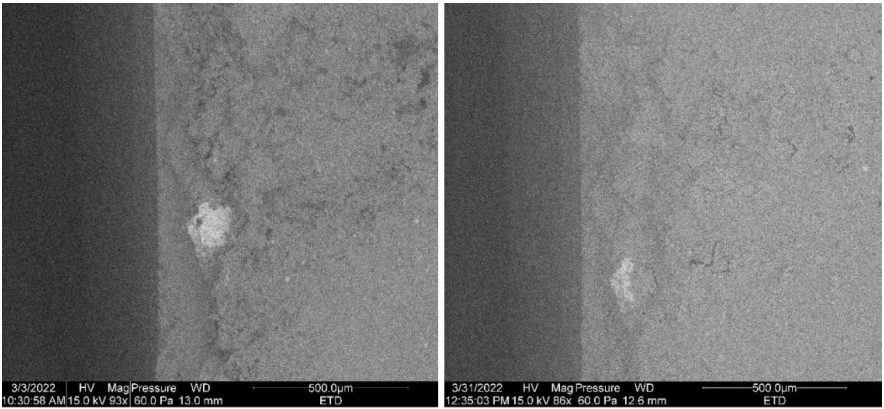
Texas Flint

Figure 6. Texas Flint Sample 2A. Left: before submersion; Right: after fourth submersion.

The Texas Flint samples seem to change more gradually than the other stone samples, wearing down equally across the entire segments. At both the lower (66-113x) and higher (568x- 1031x) magnifications, there are no large changes to the surface topography of the samples or the deterioration of the impurities in the stone (see appendix Texas Flint Samples 2A and 2A zoomed). While there are still changes to the surface, the irregularities still are affected by the exposure to the fertilizer. The impurity (pictured as the white mass), gradually gets smaller over the course of the submersions, consistently shrinking with every new round of exposure to the fertilizer. The majority of the rest of this sample seems to have relatively lower changes in surface topography, other than the softening of the edges near the white mass. This is consistent with both the other stone samples and the bone samples.
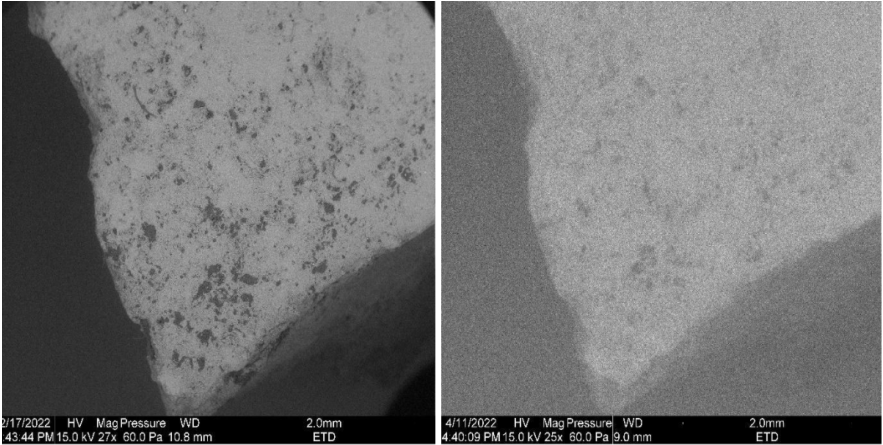
Keokuk Chert

Figure 7. Keokuk Sample 1A. Left: before submersion; Right: after fifth submersion.

The Keokuk samples show that the definition of the ridges and dips of the cortex adjacent portions of the samples gradually become deeper, creating more shadows that are visible in the images. With each successive round of submersion, these shadows become more distinct and the same sections, which means that there is consistent damage happening across the entire surface. These samples were imaged at a different magnification in order to examine if the same changes seen on the other stone samples can be seen at lower magnifications. Here, there is a clear difference in the number of shaded areas seen across the surface of the Keokuk samples. While the image on the left has very distinct, dark marks, the same places on the image to the left show much lighter markings, suggesting that the fertilizer has worn away those move vulnerable spots, developing deeper pock marks than those that exist on the other stone samples. At this magnification, there is little visible change outside the general discoloration in these samples.
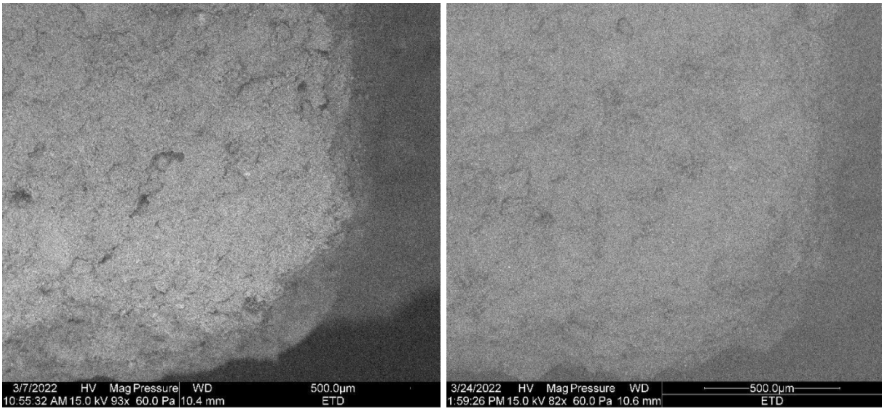
Ceramic

Figure 8. Ceramic Sample 2A. Left: before submersion; Right: after fifth submersion.

Upon first examination after the first round of submersion, the ceramic samples were significantly darker in color than the regular untempered briquettes. These samples also contained microscopic bacterial growths visible under the microscope. After each round of submersion, the edges of the briquette samples had such significant surface topographic changes to the extent that much of the definition was lost, creating the softer edges visible in the other bone and stone samples. The significant damage increased the difficulty in finding the segments imaged at the higher magnification. Even in the image on the right where there are clear demarcation of pores, there is less definition visible on the second image about, making it harder to determine the porosity of the briquette. Even the shading visible at the edges of the briquette are harder to determine, as the exposure to the fertilizer has degraded the edges to a significant extent.

DISCUSSION

The evidence has shown that there are significant changes happening to each type of material tested. Conclusively across all of the individual samples, there is a softening of the edges. This is a clear indication that supports all three hypotheses presented earlier.

The first hypothesis (*The organic fertilizer will create etching on bone*) is supported as each bone type has individually changed significantly. The deer bones exhibited the most damage in the form of pock marking, while the turkey revealed the most damage from general deterioration, and the turtle showed the most deterioration visible in the changes from on the surface topography. All three bone types have very clear visible damage to them after the first week of submersions, damage that only continued to grow

as each 5-day cycle continued. If the edges are becoming much less clear-cut as a result of exposure to the fertilizers, this changes our ability to interpret the marks we see on the bone. Shipman's (1988) results on the weathering and fracture patterns on bones as a result of their trampling study now takes on new meaning if those marks are lengthened as a result of the fertilizer, making it appear as if trampling was more prevalent at a site. The processes describe by Stiner and colleagues (1995) are also potentially affected, as the effects of burning, recrystallization, and fragmentation could be altered by the chemicals present in the fertilizer. These chemical alterations have the potential to completely mask the effects of these processes.

The second hypothesis (*The organic fertilizer will create etching on the surface of the ceramics*) is also supported, as the ceramic samples faced significant surface damage, eroding the edges and making them appear less clear and defined. While use wear is not as prevalent in ceramic studies, this is still worth noting as many of the chemical analysis relies on the exterior surfaces of the ceramics to remain intact. If the exterior surfaces that sooting and attrition are commonly found on are eroded, then the quality of the chemical samples is also like to degrade to an unsuable quality or erode away completely. This also holds true for carbonization and residues on internal surfaces, where food residues are most likely to adhere and be absorbed (Skibo 2013). Also, if the briquettes are physically eroding, then it calls in to question our perceptions of how strong or weak the ceramics are. Skibo and colleagues (1989) have determined what various types of temper do to briquettes' strength, but never has the effect of fertilizer been considered as an influencing factor. While this study has focused on the surficial changes that may occur as the result of exposure to fertilizers, there is a strong potential for internal structural changes to occur as well, especially given the amount of erosion visible on the bone and ceramic samples. Future research should focus on the structural changes that occur with such exposures.

The third hypothesis (*The organic fertilizer will create minimal to moderate damage on the stone*) is also supported. While the damage to the stone samples is less severe than it is on the other sample types, it is still visibly present in the images at the various magnifications. The most significant changes occur as pock marking and changes in the surface topography. The sample surfaces mostly seem consistent, with the pock marking occurring where there are already impurities in the stones. The edge damage visible is also considerable. Microwear analysis has developed significantly, focusing on not only the edge damage, but also polishes and residues. The characteristic traces of use wear, such as striations and microflaking, are mimicked by some of the traces caused by exposure to the biofertilizer used in this study. While not exact mimics, the damages are close enough to cause concern and the need for additional scrutiny in

microwear analyses. Additionally, polishes and resins, like the residues and carbonization in the ceramics, are likely to also become significantly affected by fertilizer. If stone samples, like the Keokuk chert, continue to show evidence of pock marks created by the fertilizer, then the fertilizer could be interrupting or ruining the polishes that scholars (e.g., González-Urquijo and Ibáñez-Estévez 2003; Trujillo-Tapia and Ramirez-Fuentes 2016; Rots and Williamson 2004) have examined extensively. In some cases, this exposure may obliterate and/or completely mask any presence of polishes or residues on flaked stone or groundstone artifacts.

Because all three hypotheses are supported, this data must be considered when examining artifacts from the field. We, as archaeologists, must be aware of the changes that fertilizer can enact on the artifacts and to what extent that can change them. Since more fertilizer is being used, and more sites located in agricultural fields are being excavated, now is the time to study what the long-term implications of this research provokes. The most directly-affected aspect of this research falls to the use-wear analysis. Because so much of this aspect of archaeology relies so heavily on the material visible at the microscopic level, these changes become more meaningful. If the edges are no longer present, but we interpret them to still be present, what data are we missing— or more importantly, misinterpreting. A vital step in moving the discipline forward is acknowledging these effects and recalibrating the tools and techniques used to diagnose wear across the various material types and integrate this preliminary data into it.

The results of this experiment are considerable, and only provoke more questions that drive more research regarding the effect that organic fertilizer has on the types of materials found in the archaeological record. Other studies, ones that are capable of going further in depth, are also an integral part of understanding how the fertilizer is affecting these samples. Further studies could, and should, also examine the implications of longer submersion times and different amounts of water. This is a new necessary aspect of archaeology that is vital to shaping our interpretations of the past.

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