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Elucidating the Mechanisms of Antibiotic Tolerance During Co-Infection of *Staphylococcus aureus* and *Streptococcus agalactiae* in Chronic Wounds

Lane McCoy

Abstract:

Polymicrobial infections are some of the most financially demanding issues in the healthcare system, requiring over \$25 billion in treatment annually in the United States alone. This results from their increased virulence, infectivity, and tolerance of common antimicrobial treatments, part of a process termed synergy. While interactions between bacteria have been appreciated for decades, we do not completely understand the exact mechanisms for how these organisms interact within the infection itself. Furthermore, questions remain about how these interactions depend on local microbes, on the environment of their host, or on spatial arrangement in the wound. Here, we sought to identify and understand novel interactions between *Staphylococcus aureus* and *Streptococcus agalactiae* (Group B Streptococcus, GBS) in a chronic wound environment. To accomplish this, we assessed tolerance to various antibiotics of each organism individually and in co-culture in our *in vitro* wound models. Furthermore, we sought to understand how a *diabetes mellitus* type II environment impacted interactions between these microbes by evaluating how a hyperglycemic

environment altered antibiotic tolerance. Our preliminary results suggest that *S. aureus* has increased tolerance to specific antibiotics when co-cultured *in vitro* with *S. agalactiae* and saw an increase in tolerance when grown in our wound models. Our data also shows that *S. agalactiae* has increased tolerance to specific antibiotics when co-cultured in wound models individually and decreased tolerance when grown with *S. aureus*. These results suggest a heightened importance of the environment on the role of antibiotic tolerance development in microorganisms when grown together, and further tests are needed to determine the exact mechanisms by which the environment alters the physiology of these two species. These investigations could be essential in producing more effective treatment strategies and hindering the progression of chronic wounds.

Introduction:

Wounds harbor many types of microorganisms, which contribute to the chronicity and overall progression of these wounds. Despite being some of the most prevalent cases in hospitals, research into microbial physiology in co-infection within the wound infection environment is lacking. Each year, chronic wounds deplete the health of patients, reduce their quality of life, and pose a substantial financial burden to healthcare systems due to their elevated levels of pathogenicity and tolerance towards common antibiotics. It is predicted that the increased levels of antibiotic tolerance within chronic wounds can be attributed

to the presence of various organisms since most organisms individually are susceptible to common treatments; however, the mechanisms that establish antibiotic recalcitrance are unknown. Bacteria can interact with each other in a variety of ways, for example: they are capable of secreting sensory molecules in a process known as quorum sensing; they can modify their environment, secreting exopolysaccharides and other materials to construct a biofilm; they can share metabolites or even lyse competitors. Knowledge of physiological alterations in common wound microbes throughout an infection is critical to develop effective antimicrobial therapies for chronic wounds. Not only this, but it is essential to investigate the microbial ecology within the wound environment to elucidate key mechanisms that allow microorganisms to resist treatment.

For this study, it was critical to use the organisms that were likely to be found together in chronic wounds. Previous studies have reported that *Staphylococcus aureus* is one of the most common organisms to be isolated from chronic ulcers, with up to 93% of the sampled wounds containing strains of *S. aureus*, many of which were methicillin resistant.¹ Further metatranscriptomic analyses within human wound infections revealed a positive correlation between *Streptococcus agalactiae* and *S. aureus*, suggestive of an interaction between these two organisms in chronic wound development, because they are commonly identified together in

¹ Fazli M, Bjarnsholt T, Kirketerp-Møller K, Jørgensen B, Andersen AS, Krogfelt KA, Givskov M, Tøtler-Nielsen T. 2009. Nonrandom distribution of *Pseudomonas aeruginosa* and *Staphylococcus aureus* in Chronic Wounds. *Journal of Clinical Microbiology*

wound samples.² Experiments were then conducted by our laboratory to observe if these organisms affected each other's growth rates within undefined Todd Hewitt broth and Lubbock wound models, and our findings suggested a significant impact on the growth of *S. agalactiae* in co-culture, providing support of interactions between these microbes within a wound environment. Finally, the impact of the environment on chronic wound development and treatment was suggested by past research on ulcers and other diseases typically associated with *diabetes mellitus* type II. Previous work suggests that the condition provides a more optimal environment for chronic wounds and allows for the communities of microorganisms within them to tolerate antibiotics at elevated levels.³

In this study, we sought to identify mechanisms used by these microbes to establish antibiotic tolerance in chronic infections. Specifically, we wanted to determine the effects of different environments on the capabilities of *S. aureus* and *S. agalactiae* to tolerate antibiotics when in co-culture in chronic wounds, and we hoped to identify key molecular mechanisms at play in the development of antibiotic recalcitrance. We hypothesized that access to glucose in diabetic conditions would provide favorable conditions for the synthesis of essential components to tolerate different antibiotics more effectively. To assess these characteristics, growth curves were performed

² Ibberson, Carolyn. Unpublished.

³ DG; G. Wound healing and diabetes mellitus. Clinics in plastic surgery. U.S. National Library of Medicine.

in different environmental conditions to determine their effects, and antibiotic tolerance assays were conducted to measure the tolerance rates of *S. aureus* and *S. agalactiae* individually and in co-culture within these environments. Many classes of antibiotics were tested, including aminoglycosides, beta-lactams, and non beta-lactams. Since each antibiotic has a unique mechanism of action, distinct mechanisms of defense could be hypothesized if the two organisms show resistance to a given treatment. Furthermore, we could determine if the presence of excess glucose – comparable to diabetic blood conditions – had any significant impact on the mechanisms by which polymicrobial infections could tolerate antibiotics.

Materials and Methods:

Minimum Growth Inhibitory Concentration Determination

To effectively determine the amount of antibiotic necessary for an antibiotic challenge, the Minimum Inhibitory Concentration (MIC) must be estimated. Every antibiotic used in these experiments had identical MIC determination tests performed. One day before the experiment, cultures were prepared by inoculating a tube of 5mL Brain Heart Infusion (BHI) broth with *S. aureus* and another identical tube with *S. agalactiae*. The *S. aureus* tube was incubated overnight in a shaker, while the *S. agalactiae* tube was incubated statically. The next day, a 12-well plate was filled with 3mL of Brain Heart Infusion broth in 8 wells. The overnight cultures were retrieved, and the

optical density at 600nm was recorded using a spectrophotometer. This information was used to calculate how much sample would be added to bring the total solution OD600 to 0.1 for each bacterium. 4 wells were inoculated with the amount calculated for *S. aureus* and another 4 with the amount calculated for *S. agalactiae*, and all wells were incubated for 3.5 hours. Once this time passed, 30uL from each well was taken and diluted to 10^{-8} in 1:10 dilutions. 10uL of the 10^{-5} through 10^{-8} dilutions was taken and spot-plated using a multi-tip pipette on one BHI Agar plate in 4 separate rows. Various concentrations of antibiotics were added to each well, including: 125ug/mL, 256ug/mL, 512ug/mL, and a 0ug/mL control. The wells were then incubated for 2 hours, and the procedure for collecting and spot-plating samples from above was repeated. All plates were incubated overnight, and the CFU/mL was calculated using the number of colonies observed. The minimum concentration that halted the most growth was determined to be the MIC for each individual organism challenged with an individual antibiotic.

Antibiotic Challenge in BHI and Wound-Like Media

One day before the experiment, cultures were prepared by inoculating a tube of 5mL Brain Heart Infusion (BHI) broth with *S. aureus* and another identical tube with *S. agalactiae*. The *S. aureus* tube was incubated overnight in a shaker, while the *S. agalactiae* tube was incubated statically. The next day, a 12 well plate was filled with 3mL BHI broth in each well. The overnight cultures were retrieved, and the optical density at

600nm was recorded using a spectrophotometer. This information was used to calculate how much sample would be added to bring the total solution OD600 to 0.1 for each bacterium. 4 wells were inoculated with *S. aureus* and another 4 wells were inoculated with *S. agalactiae*. The last 4 wells were inoculated with both organisms; however, the amount added was $\frac{1}{2}$ of the amount added to each organism individually to ensure total bacterial inocula remained constant. The wells were then homogenized, and 30uL from each well was taken and diluted to 10^{-8} in 1:10 dilutions. 10uL of each dilution from 10^{-5} to 10^{-8} were taken and spot-plated in four rows on one BHI agar plate. The co-culture samples were also spot-plated onto another BHI plate infused with 2.5ug/mL Tetracycline to isolate the *S. agalactiae* colonies. Afterwards, the wells and plates were transferred to the incubator. After 3.5 hours, the wells were removed, and the same procedure regarding dilution and spot-plating was performed. The chosen antibiotic was then added to 2 wells of each condition at the Minimum Inhibitory Concentration. The wells were then returned to the incubator for 2 hours. Afterwards, the same procedure used for sampling, diluting, and spot plating was performed. All plates were then transferred to the incubator for overnight incubation, and the CFU/mL was calculated at each time point for each condition using the number of colonies observed the next morning.

For the antibiotic challenge in wound-like media, the procedure is like the challenge in BHI with the following differences. The Lubbock wound

model was constructed with 50% bovine plasma suspended in deionized water, 45% filter sterilized Bolton Broth, and 5% laked horse blood. After homogenization, 600uL of media was added to sterile 16mm glass tubes and capped with sterile aluminum foil, with 4 tubes for *S. aureus*, 4 for *S. agalactiae*, and 4 for the co-cultures. The inoculating procedure and initial time point data collection are the same as above. However, the bacteria are allowed to incubate for a much longer period. Time points were collected at 0 hours, 24 hours, 48 hours, 72 hours, and 168 hours. The antibiotic was added after the 48-hour time point at the Minimum Inhibitory Concentration to 2 of the 4 tubes for each condition. At each time point, the data collection procedure is the same. 30uL is taken from each tube and diluted to 10^{-8} , which is then spot plated from 10^{-5} to 10^{-8} on BHI agar plates, and co-cultures are also spot-plated on 2.5ug/mL Tetracycline plates. CFU/mL values for each time point were recorded the day after the data was collected, which would be the same day as the next time point being collected.

Hyperglycemic Growth Curve in BHI and Wound-Like Media

One day before the experiment, cultures were prepared by inoculating a tube of 5mL Brain Heart Infusion (BHI) broth with *S. aureus* and another identical tube with *S. agalactiae*. The *S. aureus* tube was incubated overnight in a shaker, while the *S. agalactiae* tube was incubated statically. The next day, a 12 well plate was filled with 3mL BHI broth in 6 wells. The other 6 wells

were supplemented with dextrose to bring the glucose concentration to 4mmol, assuming the original concentration of BHI was 2mmol. The overnight cultures were retrieved, and the optical density at 600nm was recorded using a spectrophotometer. This information was used to calculate how much sample would be added to bring the total solution OD600 to 0.1 for each bacterium. 4 wells were inoculated with *S. aureus* and another 4 wells were inoculated with *S. agalactiae*. The last 4 wells were inoculated with both organisms; however, the amount added was $\frac{1}{2}$ of the amount added to each organism individually. Each condition had 2 wells that were supplemented with dextrose. The wells were then homogenized, and 30uL from each well was taken and diluted to 10^{-8} in 1:10 dilutions. 10uL of each dilution from 10^{-5} to 10^{-8} were taken and spot-plated in four rows on one BHI agar plate. The co-culture samples were also spot-plated onto another BHI plate infused with 2.5ug/mL Tetracycline to isolate the *S. agalactiae* colonies. Afterwards, the wells and plates were transferred to the incubator. Every 1.5 hours, a time point was taken using the same procedure for sampling, diluting, and spot-plating detailed above. The procedure was repeated 5 times, once at 0 hours, 1.5 hours, 3 hours, 4.5 hours, and 6 hours. All plates were then transferred to the incubator for overnight incubation, and the CFU/mL was calculated at each time point for each condition using the number of colonies observed the next morning.

For the hyperglycemic curve in wound-like media, the procedure is like the growth curve in BHI with the following modifications. The wound model was created using the same procedure detailed in the wound-media antibiotic challenge. 6 sterile 16mm tubes were filled with 600uL of media, while the other 6 sterile 16mm tubes were filled with 600uL of media and supplemented with 4mmol of dextrose, assuming the original media is minimal in glucose levels. All tubes were capped with sterile aluminum foil. 4 tubes were for *S. aureus*, 4 for *S. agalactiae*, and 4 for the co-culture, and each condition used 2 tubes of media supplemented with dextrose. The inoculating procedure and initial time point data collection are the same as above. However, the bacteria are allowed to incubate for a much longer period. Time points were collected at 0 hours, 24 hours, 48 hours, 72 hours, and 168 hours. At each time point, the data collection procedure is the same. 30uL is taken from each tube and diluted to 10^{-8} , which is then spot plated from 10^{-5} to 10^{-8} on BHI agar plates, and co-cultures are also spot-plated on 2.5ug/mL Tetracycline plates. CFU/mL values for each time point were recorded the day after the data was collected, which would be the same day as the next time point being collected.

Antibiotic Challenge in Hyperglycemic Wound-Like Media

One day before the experiment, cultures were prepared by inoculating a tube of 5mL Brain Heart Infusion (BHI) broth with *S. aureus* and another identical tube with *S. agalactiae*. The *S.*

aureus tube was incubated overnight in a shaker, while the *S. agalactiae* tube was incubated statically. The next day, the wound model was constructed with the same procedure as described in the antibiotic challenge in wound media, and it was supplemented with dextrose to bring the concentration to 4mmol. 12 16mm tubes with aluminum foil caps were sterilized and used for this experiment. Each tube was filled with 600uL of the hyperglycemic wound models. The overnight cultures were retrieved, and the optical density at 600nm was recorded using a spectrophotometer. This information was used to calculate how much sample would be added to bring the total solution OD600 to 0.1 for each bacterium. 4 tubes were inoculated with *S. aureus* and another 4 tubes were inoculated with *S. agalactiae*. The last 4 tubes were inoculated with both organisms; however, the amount added was $\frac{1}{2}$ of the amount added to each organism individually. The wells were then homogenized, and 30uL from each well was taken and diluted to 10^{-8} in 1:10 dilutions. 10uL of each dilution from 10^{-5} to 10^{-8} were taken and spot-plated in four rows on one BHI agar plate. The co-culture samples were also spot-plated onto another BHI plate infused with 2.5ug/mL Tetracycline to isolate the *S. agalactiae* colonies. Afterwards, the wells and plates were transferred to the incubator. In total, time points were taken at 0 hours, 24 hours, 48 hours, 72 hours, and 168 hours. The procedure for sampling, data collecting, and spot-plating was repeated as described for every time point. CFU/mL values for each time point were recorded the day

after the data was collected, which would be the same day as the next time point being collected.

Results:

The two antibiotics that were primarily used for these experiments included Tobramycin, an aminoglycoside, and Methicillin, a beta-lactam. For the antibiotic assays, it was crucial to determine the minimum inhibitory concentration (MIC) that would be the most bactericidal throughout growth. To determine these MICs, we examined the effects of various concentrations of antibiotic on bacterial growth after three and a half hours of incubation and observed the minimum bactericidal concentration for each antibiotic.

Bacteria	Antibiotic	MIC (ug/mL)
S. aureus	Tobramycin	256ug/mL
S. aureus	Methicillin	512ug/mL
S. agalactiae	Tobramycin	256ug/mL
S. agalactiae	Methicillin	125ug/mL

Figure 1: Minimum Inhibitory Concentration of *S. aureus* and *S. agalactiae* to Two Different Antibiotics. These results were obtained by recording the minimum concentration that caused a CFU/mL < 10⁶ for a given bacteria after 3.5 hours of growth. These values gave the concentrations of antibiotics used in the challenge, where the concentration was equal to the greatest MIC of the two organisms to a given antibiotic.

These results indicate a diverse range of tolerance to the different antibiotics tested for the given experiment. These show that the MIC for the co-cultures with Tobramycin would be 256ug/mL and the MIC for the co-cultures with Methicillin would be 512ug/mL. Each result shows the minimum concentration where extraordinarily little

to no growth was detected for each condition. It is also noted that the *S. aureus* strain used is methicillin resistant, so its true minimum inhibitory concentration is likely much higher than the expected result.

Following the confirmation of minimum inhibitory concentrations, we sought to analyze how the tolerance of *S. aureus* and *S. agalactiae* would be impacted when they were grown individually vs in co-culture. It was hypothesized that both organisms would benefit in increased tolerance when grown together due to high correlations previously established in the literature and metatranscriptomic analysis. The tolerance of each organism to tobramycin, individually and in co-culture, was assayed in BHI media and our *in vitro* wound models. It was observed that *S. aureus* tended to grow significantly better ($p<0.05$) when incubated with *S. agalactiae* in BHI and challenged with tobramycin compared to individually. Figure 7 suggests that the survivability of *S. aureus* in co-culture was higher than individual survival rates. Further, growth of *S. aureus* in wound-like media demonstrates a significant difference in growth; however, it was observed that the organism did significantly better individually ($p<0.05$) rather than in co-culture, according to Figures 4 and 7. It was also observed that *S. agalactiae* had significantly greater tolerance in both BHI and wound conditions ($p<0.05$) where it was incubated individually. Figures 3, 5, and 6 demonstrate that *S. agalactiae* typically survived and grew better without the presence of *S. aureus*. This is indicated by the

significantly lower numbers and survival frequencies observed in co-culture.

Tobramycin Assay of *S. aureus* Individually and in Co-Culture in BHI

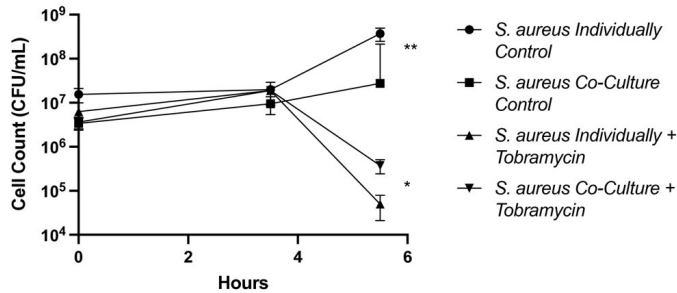


Figure 2: Tobramycin Assay of *S. aureus* Individually and in Co-Culture in Brain Heart Infusion media. The data was collected by counting the number of colonies that appeared on each dilution spot and dividing it by the dilution. These values were then averaged across the four rows, and then the data was averaged across replicates of the experiment. The averages were also used to calculate standard deviations and standard error at each point. The CFU/mL was then plotted with time to gauge the appropriate growth rates in each condition.

Tobramycin Assay of *S. agalactiae* Individually and in Co-Culture in BHI

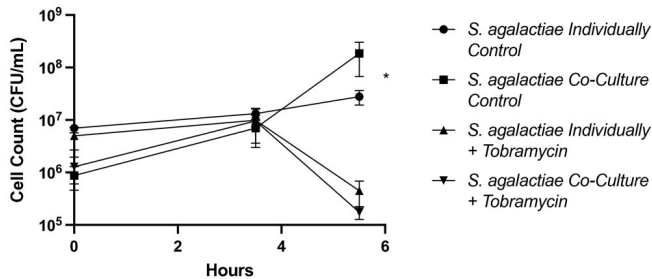


Figure 3: Tobramycin Assay of *S. agalactiae* Individually and in Co-Culture in Brain Heart Infusion media. The data was collected by counting the number of colonies that appeared on each dilution spot and dividing it by the dilution. These values were then averaged across the

four rows, and then the data was averaged across replicates of the experiment. The averages were also used to calculate standard deviations and standard error at each point. The CFU/mL was then plotted with time to gauge the appropriate growth rates in each condition.

Tobramycin Assay of *S. aureus* Individually and in Co-Culture in Wound Media

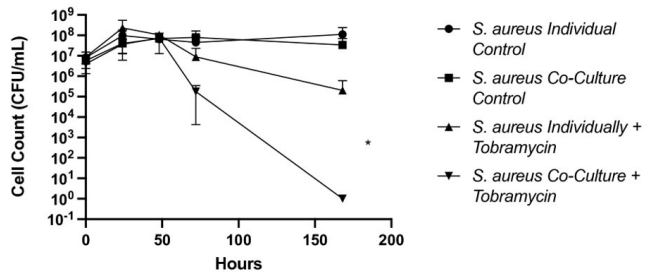


Figure 4: Tobramycin Assay of *S. aureus* Individually and in Co-Culture in Lubbock wound media. The data was collected by counting the number of colonies that appeared on each dilution spot and dividing it by the dilution. This procedure was the same across time points. These values were then averaged across the four rows, and then the data was averaged across replicates of the experiment. The averages were also used to calculate standard deviations and standard error at each point. The CFU/mL was then plotted with time to gauge the appropriate growth rates in each condition.

Tobramycin Assay of *S. agalactiae* Individually and in Co-Culture in Wound Media

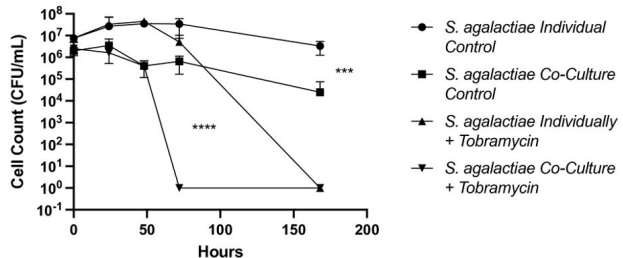
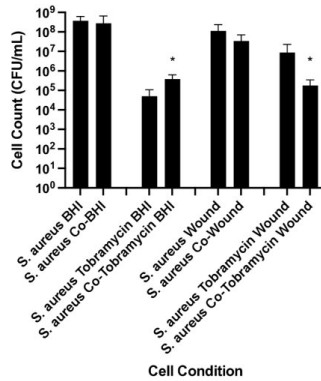


Figure 5: Tobramycin Assay of *S. agalactiae* Individually and in Co-Culture in Lubbock wound media. The data was collected by counting the number of colonies that appeared on each dilution spot and dividing it by the dilution. This procedure was the same across time points. These values were then averaged across the four rows, and then the data was averaged across replicates of the experiment. The averages were also used to calculate standard deviations and standard error at each point. The CFU/mL was then plotted with time to gauge the appropriate growth rates in each condition.

Final Counts of *S. aureus* in Multiple Conditions when Challenged with Tobramycin



Final Counts of *S. agalactiae* in Multiple Conditions when Challenged with Tobramycin

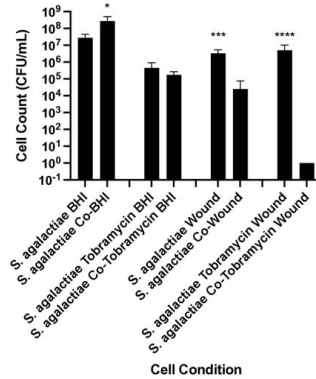
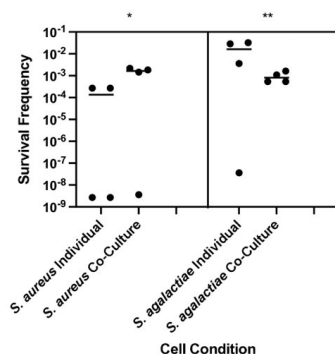


Figure 6: Final Counts of *S. aureus* and *S. agalactiae* in Multiple Conditions when Challenged with Tobramycin. This data was collected by finding the difference in growth for each condition when challenged with Tobramycin. This was achieved for the BHI and wound models by subtracting the final CFU/mL at the last time point from the original CFU/mL at the first time point. These values were then averaged across replicates and the numbers were used to calculate the standard deviation and standard error for each condition. These values were then plotted to see if the growth rate was different between individual bacteria and co-cultures.

Survival Frequency of *S. aureus* and *S. agalactiae* When Challenged with Tobramycin in BHI



Survival Frequency of *S. aureus* and *S. agalactiae* When Exposed to Tobramycin in Wound Media

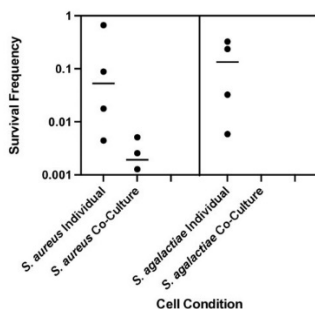


Figure 7: The Survival Frequencies of *S. aureus* and *S. agalactiae* when Challenged with Tobramycin in BHI and Wound media. This data was collected by dividing the

final CFU/mL obtained in the condition with Tobramycin by the average final CFU/mL of the corresponding condition without Tobramycin. These values were then averaged, and the data was used to calculate the standard deviation, first and third quartiles, and project these values on a boxplot. This plot shows the variation of the survival percentages for each condition when challenged with Tobramycin.

After addition of the antibiotic to the BHI cases at 3.5 hours and the wound cases at 48 hours, we observed that the survival frequencies of *S. aureus* tended to fluctuate based on the environment and condition, while the survival frequency patterns of *S. agalactiae* remained essentially unchanged. It was also noticed that both organisms survived much better in the wound media compared to the BHI media due to the higher survival frequencies in wound media observed in Figure 7. When analyzing Figures 2 and 6, it is also observed that the growth of *S. agalactiae* when challenged with tobramycin was not significantly impacted when co-cultured in BHI media; however, survival frequencies indicate that these growths were significant, indicating that this organism is at a detriment when it is challenged with *S. aureus*.

Following these observations, we sought to assess the effects of a hyperglycemic environment on the growth rates of *S. aureus* and *S. agalactiae* to determine if interactions between these organisms in these conditions are possible. Growth curves of *S. aureus* and *S. agalactiae* were performed individually and in co-culture in two different

environments: hyperglycemic BHI and hyperglycemic wound-like media, each environment supplemented with dextrose to bring the concentration to 4mmol. The CFU/mL for each species was monitored at each time point for 6 hours.

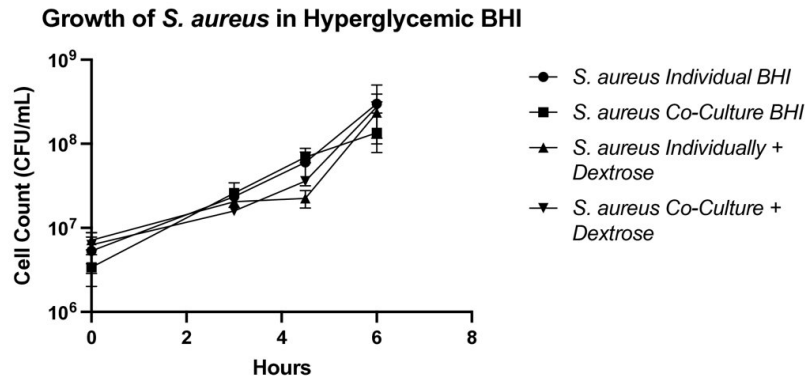


Figure 8: Growth Curve of *S. aureus* in Diabetic BHI Conditions. The data was collected by counting the number of colonies that appeared on each dilution spot and dividing it by the dilution. This procedure was the same across time points. These values were then averaged across the four rows, and then the data was averaged across replicates of the experiment. The averages were also used to calculate standard deviations and standard error at each point. The CFU/mL was then plotted with time to gauge the appropriate growth rates in each condition.

Growth of *S. agalactiae* in Hyperglycemic BHI

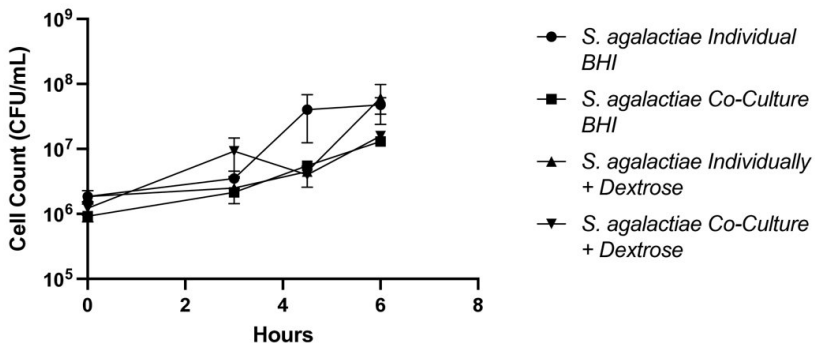


Figure 9: Growth Curve of *S. agalactiae* in Diabetic BHI Conditions. The data was collected by counting the number of colonies that appeared on each dilution spot and dividing it by the dilution. This procedure was the same across time points. These values were then averaged across the four rows, and then the data was averaged across replicates of the experiment. The averages were also used to calculate standard deviations and standard error at each point. The CFU/mL was then plotted with time to gauge the appropriate growth rates in each condition.

Growth of *S. aureus* in Hyperglycemic Wound Media

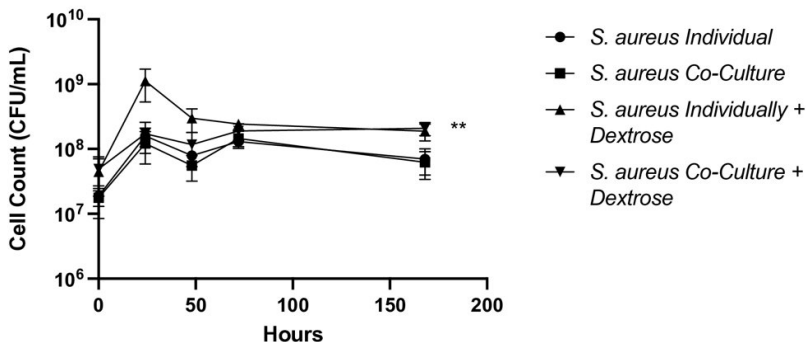


Figure 10: Growth Curve of *S. aureus* in Hyperglycemic Wound Conditions. The data was collected by counting the number of colonies that appeared on each dilution spot and dividing it by the dilution. This procedure was the same across time points. These values were then averaged across the four rows, and then the data was averaged across replicates of the experiment. The averages were also used to calculate standard deviations and standard error at each point. The CFU/mL was then plotted with time to gauge the appropriate growth rates in each condition.

Final Counts of *S. aureus* in Multiple Growth Conditions

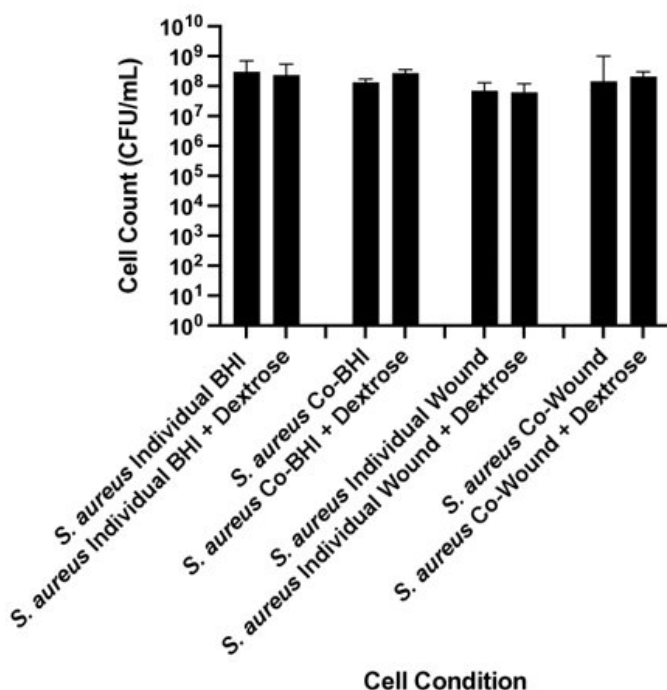


Figure 11: The Final Cell Counts of *S. aureus* in a Diabetic Growth Curve in Brain Heart Infusion Broth. The

data was collected by taking the final CFU/mL for every point in a condition and averaging them together to get the final cell counts. These values were also used to calculate a standard deviation and standard error for each condition. These values were then plotted to compare the final cell counts in conditions that were not supplemented with dextrose vs conditions that were.

Growth of *S. agalactiae* in Hyperglycemic Wound Media

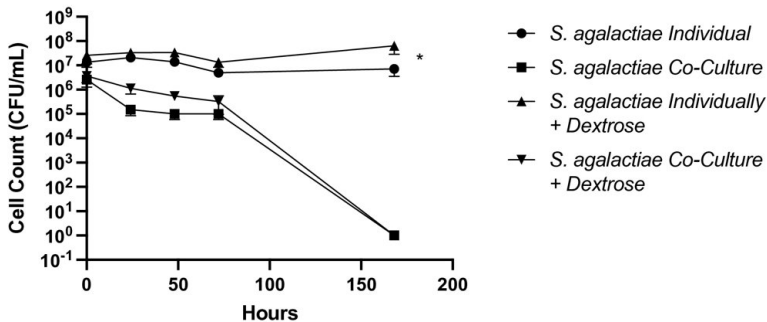


Figure 12: Growth Curve of *S. agalactiae* in Hyperglycemic Wound Conditions. The data was collected by counting the number of colonies that appeared on each dilution spot and dividing it by the dilution. This procedure was the same across time points. These values were then averaged across the four rows, and then the data was averaged across replicates of the experiment. The averages were also used to calculate standard deviations and standard error at each point. The CFU/mL was then plotted with time to gauge the appropriate growth rates in each condition.

Final Counts of *S. agalactiae* in Multiple Growth Conditions

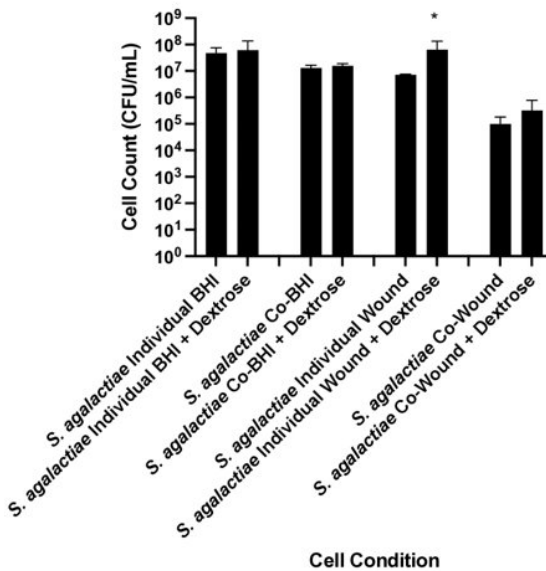


Figure 13: The Final Cell Counts of *S. agalactiae* in a Diabetic Growth Curve in Brain Heart Infusion Broth. The data was collected by taking the final CFU/mL for every point in a condition and averaging them together to get the final cell counts. These values were also used to calculate a standard deviation and standard error for each condition. These values were then plotted to compare the final cell counts in conditions that were not supplemented with dextrose vs conditions that were.

In the hyperglycemic BHI models, the growth rates of *S. aureus* and *S. agalactiae* remained remarkably similar in the individual conditions no matter if dextrose was present. Notable observations were made in the organisms grown in co-culture in Figures 8 and 9. When compared with our previous studies, the co-cultured organisms, primarily *S. agalactiae*, were never able

to reach individual levels when grown in non-hyperglycemic BHI media. For the rest of the conditions, there were hardly any differences observed in growth rates or numbers in hyperglycemic BHI. In our hyperglycemic wound models, however, noticeable differences were observed in both trends of growth in *S. aureus* and *S. agalactiae*. For *S. aureus*, the conditions with hyperglycemic media both outperformed their non-hyperglycemic controls by a statistically significant margin ($p < 0.05$). For *S. agalactiae*, the individual condition in hyperglycemic media grew significantly better; however, both co-cultures ended up having similar death rates and times. The hyperglycemic co-culture, on the other hand, was able to maintain significantly higher cell counts throughout the curve itself.

Discussion:

Based on the results for the various assays, there are numerous conclusions that can be made. When analyzing the results of the Tobramycin assays in BHI and Lubbock-wound like media, we observe that *S. aureus* performed better against Tobramycin in BHI and worse in wound-like media. We also see that *S. agalactiae* performed better against Tobramycin in wound-like media and worse in BHI. This is reflected in the percent survival distributions, and both disparities were found to be statistically significant ($p < 0.05$). What this shows is that the tolerance of each organism tended to shift whenever the environment changed, which indicates that the environment played a significant role in developing antibiotic tolerance for both species to

aminoglycosides like Tobramycin. Furthermore, this indicates that each species could have secreted different virulent factors in each environment, which may have also contributed to the ability to tolerate antibiotics. While these factors cannot be conclusively determined by this study, we can conclude that the environment plays a role in antibiotic tolerance, and further studies can be done to elucidate what exactly would be the main contributor to these differences.

Based on these conclusions, determining growth rates in diabetic conditions became an essential next step to investigating the effects of the environment on antibiotic tolerance. Based on the results, we can conclude that diabetic conditions did not seem to make any difference in the growth of either organism in BHI media. However, it was noted that for *S. aureus*, all growth rates were nearly the same individually and in co-culture. In our previous growth curves, it was noted that *S. aureus* did worse when grown in co-culture, so this finding may indicate that the availability of extra glucose allowed for *S. aureus* to achieve regular growth rates when in the presence of *S. agalactiae*. The same result can be observed for *S. agalactiae*. The extra glucose added to the media did not cause any spike in growth rates in BHI; however, it eliminated the competition between *S. aureus* and *S. agalactiae* that was observed in non-hyperglycemic replicates. This suggests that hyperglycemic environments are favorable for the sustained growth and maintenance of bacteria levels in chronic infections. In our wound models, preliminary data

suggests that the addition of glucose caused a huge spike in growth for both *S. aureus* and *S. agalactiae*. When compared to the control, growth rate differences were much more noticeable. Since the wound-media contains less glucose than regular BHI – equivalent to normal blood sugars –, this difference indicates that diabetic blood is a huge contributing factor to the growth of chronic wounds. Future tests will then observe if this environmental factor has any effect on the development of antibiotic tolerance in co-cultures.

While this study is useful for suggesting the potential for interactions that lead to antibiotic tolerance, it is not guaranteed to identify a precise mechanism for which this occurs. Future studies should investigate the molecular aspects of these interactions to reveal novel RNA or protein mechanisms that might contribute to antibiotic tolerance in chronic wounds. Furthermore, it is also suggested that this study does not account for increased *S. agalactiae* virulence in chronic wounds. Past research suggests that *S. agalactiae* virulence is triggered in a wound hyperinflammatory response, characterized by hordes of neutrophils that release granular molecules designed to attack the bacteria community in a chronic wound.⁴ Studies that repeat these experiments while accounting for *S. agalactiae* activation would be useful to accurately determine the role of *S. agalactiae* in antibiotic tolerance development within a chronic wound.

⁴ Keogh RA, Haeberle AL, Langouët-Astrié CJ, Kavanaugh JS, Schmidt EP, Moore GD, Horswill AR, Doran KS. 2022. Group B Streptococcus adaptation promotes survival in a hyperinflammatory diabetic wound environment. Science Advances

These studies may help advance the knowledge of microbial interactions between these two organisms in chronic wounds. While this study does not account for the entire microbiome within the wound environment, it is critical to isolate the key community mechanisms for establishing and maintaining infection so that future treatments can be designed to attack these crucial factors, saving millions in chronic healthcare treatment.

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The New Minstrel Hypothesis

Ryan Rogez

I. Jim Crow, Minstrelsy, and Lineage.

A fact well-known to most is that following the American Civil War, the era of racial discrimination was far from finished. Often referred to as the “Jim Crow Era”, free African Americans endured legal discrimination in the later 19th and early 20th centuries. The term Jim Crow arose from a minstrel stage play where a white actor performed in blackface as the titular *Jim Crow*. Because of its popularity, the term became a ubiquitous epithet for black Americans. In the near century between the Civil War and the Civil Rights Movement, the cultural importance of Jim Crow faded away. However, cultural signifiers of its day remained, while the reception to the messaging changed.⁵ With cultural revolutions like the Harlem Renaissance pushing the United States into an integrated future, it seemed that the culture of racial ridicule would inevitably fade away. But as pointed out by Karl Miller, even revolutionary black artists were interpreted as “extensions of minstrelsy.”⁶ This entails that there might in fact be *no* disconnection between minstrelsy and American popular culture as it has evolved post-Civil Rights. This theory, the

⁵ Ferris State University. 2022. *The Jim Crow Era*. Ferris State University, <https://www.ferris.edu/HTMLS/news/jimcrow/timeline/jimcrow.htm>

⁶ Miller, Karl Hagstrom. 2010. *Segregating Sound: Inventing Folk and Pop Music in the Age of Jim Crow*. Durham: Duke University Press, pg. 195

Minstrel Hypothesis, exists to prove that *all* American popular music (and much of the general popular culture) can be linked to minstrelsy in the Jim Crow Era. Although, the totality of the theory has been dismantled by academics such as Lee Brown of *The Journal of Aesthetics & Art Criticism*:

“The bare, abstract concept of [whites’] identification [with black people] could not tell us what we need to know about minstrelsy in order to evaluate the hypothesis. Any number of white American kids must have identified with Michael Jordan in the 1990s. The phenomenon *might* have been indebted to blackface theater. But I would bet money against it.”⁷

Despite the initial theory being flawed, I posit that there is a linked history from Minstrelsy to modern music, which has been carried by the societal transition of popular culture and the aesthetic choices of specific artists. This is not to say that all music is inspired from minstrelsy, rather minstrelsy has informed both audiences’ and artists’ perceptions of black people in media.

⁷ Brown, Lee B. 2013. “Can American Popular Vocal Music Escape the Legacy of Blackface Minstrelsy?” Vol. 71 Issue 1, p 94

II. What Does a Minstrel Show Entail?

According to Brown's analysis, the desire of a white subject to identify with African Americans is a key to understanding minstrelsy, but it does not encapsulate the performance style of minstrel performers. The previously mentioned Karl Miller describes a tendency of some minstrel performers to believe that their usage of blackface was representative of their Southern heritage. He says that it was common for Southern performers such as Vernon Dalhart to claim that his ability to properly mock Southern African Americans' dialect was proof that he held true roots in the South: "African American artists had seized the representation of black music from white minstrels... white artists [such as Dalhart] reclaimed the authority to perform black song by insisting it constituted their southern heritage."⁸

However, just a few examples of this peculiar, backwards identification do not tell the full story of minstrelsy. The actual content is not elucidated stylistically by this association, nor does it (properly) explain the art's purpose in society. To understand minstrelsy, you look at the literal elements of performance. Possibly the most influential aspect is the humorous nature of the performance. White performers put on satirical plays, often while wearing blackface, with elaborate sing-and-dance numbers parodying the known

⁸ Miller, Karl Hagstrom. 2010. *Segregating Sound: Inventing Folk and Pop Music in the Age of Jim Crow*. Durham: Duke University Press pg. 142

stereotypes of African Americans at the time.⁹ They frequently performed traditional black songs, with an exaggerated dancing style emphasizing the sexuality of the blackface-performer. This sexual style is most likely related to a common trope originating from 18th century England in which black people were branded as an “icon for deviant sexuality.”¹⁰

These performances relied heavily on *ridicule* as humor, but they were not often perceived as disrespectful or even unrealistic. Brown illustrates the value given to minstrelsy by society in the 18th century: “At one time [minstrelsy] was the most popular entertainment available to American audiences. Mark Twain and Abraham Lincoln loved it.”¹¹ Similar to Dalhart’s assertion that his performance represents his connection to the authentic south, many Americans saw the plays as humorous takes on true events. Of course, as the popularity of minstrelsy began to decline, so did this association with reality.

The effect minstrel shows had was enhanced by popular support in the press for this type of stereotype-based humor. It was common for many decades, but especially in the early periods of minstrelsy, for newspapers, or other forms of editorials to publish minstrel stereotypes, usually in the form of comics and advertisements. In one

^{9 9} Brown, Lee B. 2013. “Can American Popular Vocal Music Escape the Legacy of Blackface Minstrelsy?” Vol. 71 Issue 1, p 92

¹⁰ Rarey, Matthew Francis. 2020. “And the Jet Would Be Invaluable”: Blackness, Bondage, and The Beloved. Vol. 102 Issue 3, p 33

¹¹ Brown, Lee B. 2013. “Can American Popular Vocal Music Escape the Legacy of Blackface Minstrelsy?” Vol. 71 Issue 1, p 92

instance, the Georgia Telegraph newspaper published eighty-one jokes or pieces including black characters between the years of 1855-1860.¹² It is important to note that many of the readers might have never seen a minstrel show but were able to take part in the ridicule in their daily lives.

Finally, Although I have emphasized the humorous intent of minstrel shows, the elements of a minstrel performance ultimately combine to form a threat of violence. Frequently, the subject matter of the various plays, songs, or other performances would actively reference the hostility whites held against African Americans. For example, one song entitled “You Shall Be Free” features two white singers reminiscing upon a lynching.¹³ Lynching, hate crimes, or racially motivated attacks would regularly take center stage, with everything played off for laughs.

III. Early Minstrelsy and the Rise of Black Singers

Minstrelsy arose in 1830’s New York, with legend reporting that Thomas D. (“Daddy”) Rice was the first white performer to put on blackface.¹⁴ White performers rubbed coal or soot on their faces and performed in a way which characterized African Americans as lazy, ignorant, superstitious, hypersexual, and prone to “thievery and

¹² Narayan, Rosalyn. 2022. “*Humor, Minstrelsy, and the Representation of African Americans in Macon’s Georgia Telegraph and Georgia Citizen, 1855–1860.*” *Civil War History*. Vol. 68. Issue 2, p1-18.

¹³ Curren, Grayson Haver. 2020. “*How to Handle the Hate in America’s Musical Heritage.*” *New York Times*, Oct. 14. Pg. 2

¹⁴ Brown, Lee B. 2013. “*Can American Popular Vocal Music Escape the Legacy of Blackface Minstrelsy?*” Vol. 71 Issue 1, p 92

cowardice”. Minstrelsy dominated American popular culture, and elements such as blackface became a staple of American theater in the South (Smithsonian). However, the emergence of minstrelsy coincides with a decline in support for the institution of slavery. The attitudes on race relations were shifting exponentially, tilting toward an eventual civil war. This allowed for African Americans to find footing in the realm of music at the same time white audiences fell in love with minstrelsy. After some fifteen to twenty years since minstrelsy took over American popular culture, an African American artist was about to break ground.

Singer Elizabeth Taylor Greenfield (1824-1876) might be the best example of a black artist facing the force of minstrel stereotypes in the 1850s. Greenfield was famously known as the “Black Swan”, performing in a style in direct contrast to the minstrel play which dominated the previous twenty years. American publications were on top of Greenfield’s debut public performance in 1851, instantly lambasting her as a ‘Lucy Long’ stereotype. ‘Lucy Long’ being a reference to a popular minstrel tune: *Miss Lucy Long*.¹⁵ This was the standard for Greenfield, as she spent her entire career fighting off the stereotypes thrown at her

¹⁵ Soroka, Adam. 2004. *Miss Lucy Long*. Uncle Tom’s Cabin and American Culture. <http://utc.iath.virginia.edu/minstrel/lucylongfr.html>

from white society.¹⁶ However, supporters understood how important her performance was:

“In the words of one Boston reviewer, Greenfield was a “wonderful vocalist, who seems to be asserting for the African race a position in the musical world, a good deal above the Dandy Jim and Lucy Long school.” Especially for abolitionists or those sympathetic to the cause of education for free Blacks, who embraced the ideology of racial uplift, Greenfield publicly displayed proof that a freed slave could learn to exhibit the European musical accomplishments that were expected of middle and upper-class women,”

Greenfield made waves as one of the first known former slave to be given this type of stage, garnering a national tour (which did not include any Southern stops). Most white Americans could never imagine a black woman would be capable of producing the sounds of white, European singers. Similar to the likes of Phillis Wheatley, discovering her caused white audiences to start an intense debate over the validity of her race. Theories swirled about her African descent, some claiming her to be mixed-race while others took her at face-value. At first, many thought she was simply a minstrel performer in blackface makeup. After the

¹⁶ Chybowski, Julia J. 2021. “*Blackface Minstrelsy and the Reception of Elizabeth Taylor Greenfield.*” Vol. 15 Issue 3, p306

initial media circus, Greenfield would be dubbed the “Black Swan” in reference to a European singer eponymous with the bird. But since her skin color was such a topic of interest, it turned into a racialized nickname.¹⁷

One would question why the racial identity of a singer would matter to her performance, but the answer would not simply just be “racism”. Sure, the fact that most Americans held some sort of racial bias should be incorporated into why Greenfield was received this way, but minstrelsy’s role is integral. White society was prepared to judge Greenfield’s race, majorly in part to decades of putting on minstrel shows. Traditionally, the ‘black’ characters would exhibit what at that time was considered uneducated and unfashionable behavior. Their behavior was supposed to be met with the assumption that the character’s inadequacy was tied to their race.¹⁸ Greenfield served as one of the principal examples of this idea being shattered, as there were no perceived flaws in her performance nor fashion. This explains the controversy surrounding Greenfield, she symbolizing a change in how society valued African Americans, long thought of as a resource to be used.

Racist audiences were prompted by Greenfield’s challenge to these racial stereotypes, but they were prepared to respond this way because of minstrelsy. Racism was an essential part of

¹⁷ Chybowski, Julia J. 2021. “*Blackface Minstrelsy and the Reception of Elizabeth Taylor Greenfield*.” Vol. 15 Issue 3, p306-307

¹⁸ Chybowski, Julia J. 2021. “*Blackface Minstrelsy and the Reception of Elizabeth Taylor Greenfield*.” Vol. 15 Issue 3, p307.

popular culture in the form of legitimized minstrel theater. This was further affirmed in the media, who gave even more audiences a taste of minstrelsy. With decades of minstrel performances being considered an art that satirizes real events, audiences took home the idea that the expectations of 'black' characters were real. The response to Greenfield proves this, as the perspectives on her tour were formulated through the lens of minstrelsy, even including those sympathetic to her plight.

IV. The Reflections of Minstrelsy

The aforementioned Minstrel Hypothesis was discredited for its unnecessary entirety. However, the idea that modern music is still connected to minstrelsy is not far-fetched. Elizabeth Taylor Greenfield endured the scorn of the media even before African Americans gained emancipation. The following Jim Crow Era is normally characterized as a time of extreme discrimination towards free African Americans, whose laws and beliefs would inevitably dwindle out of the United States. As with the era, cultural staples that arose from minstrelsy also became less prominent. Nonetheless, the same strategies used by the media against Greenfield were still prevalent into the era of music recording. Though before music could be recorded and sold, experimentation on sound recording devices was necessary.

The first audio recording device was Thomas Edison's phonograph.¹⁹ Except, the first audiences responded differently than expected. Most white audiences were stunned to the point of being intimidated by the phonograph, but the same could not be said for Indigenous groups: "[Native participants] brought their own cultural equipment to the experience of being recorded, enabling them to face the mechanical wonder with more nonchalance [than anticipated] ... sometimes with greater sangfroid and dignity than the cultural intent on recording the."²⁰ Accounts from anthropologists detailing Native peoples' responses to the phonograph were considered so notable that Indigenous people became a 'mascot' for the device. Racist caricatures sprouted from advertisers and newspapers, mimicking the style of Jim Crow minstrelsy.²¹ This illuminates the stranglehold minstrelsy still had on American culture into the 20th century.

Regardless, society was becoming more integrated, and the new advent of music recording would help acclimate African Americans into popular culture. By the 1930's, Music publisher Lester Melrose began experimenting with black genres: "Melrose and the other giants of the race-

¹⁹ Brady, Erika. 1999. *A Spiral Way: How the Phonograph Changed Ethnography*. Jackson: University Press of Mississippi. Pg. 11

²⁰ Brady, Erika. 1999. *A Spiral Way: How the Phonograph Changed Ethnography*. Jackson: University Press of Mississippi. Pg 30-31

²¹ Brady, Erika. 1999. *A Spiral Way: How the Phonograph Changed Ethnography*. Jackson: University Press of Mississippi. Pg 30-33

record industry were working to create a black pop music - a style that could reach large, diverse audiences simultaneously, would yield financial benefits that the companies could control, and could be easily produced and reproduced.”²² For the first time, black artists were sought out as potentially the ‘next big thing’ in popular music. However, Melrose specifically crafted the musical aspects to appeal to as many audiences as possible. He handpicked artists and limited their creative freedom, staunchly countering the jazz tendency to improvise. Repeatability created a product which could be copyrighted for profit. Melrose was not aware at the time, but his business model would take over the music industry, and his desire to mix genres from varying backgrounds laid the groundwork for much of popular music’s evolution.

The mixing of genres was wildly popular, sparking decades of musical experimentation among both black and white artists. Genres like rockabilly, country, R&B and even rock and roll were born from this era.²³ However, as the decades went by the country had more important issues, recovering from a depression and two World Wars. As the country was hitting its Golden Age the relevance of these genres grew exponentially. Music collector Harry Smith helped usher in this wave with his work the *Anthology of American Folk Music*. Smith specifically crafted a view which was

²² Filene, Benjamin. 2000. *Romancing the Folk: Public memory and American Roots Music*. Chapel Hill: UNC Press. Pg 80

²³ Kot, Greg. 2022. *Rock and roll*. Britannica, <https://www.britannica.com/art/rock-and-roll-early-style-of-rock-music>

contrary to popular thinking on folk music, ‘folk’ being in reference to Americans’ origin or source for culture. His set shattered perceptions of what old culture was and opened up the door for a world of artistic experimentation. Smith saw this as an upside, citing that music has the power to change society: “I had the feeling that the essence that was heard in those types of music that would become something really large and fantastic... I imagine it having some kind of social force for good.”²⁴ Many would consider the following decades proof of Smith’s hunch, with a successful Civil Rights Movement earning African Americans a new level of freedom. Regardless of their success, the perception of spotlighted African Americans shows how similar the era was to its predecessors.

In 1961, singer Leslie Uggams became the first female African American singer to star in a weekly television variety show.²⁵ She performed live sing-alongs over many hour-long airing periods of *Sing Along with Mitch*, hosted by Columbia Records’ Mitch Miller. Mitch considered Uggams a generational talent and wanted to avoid having her race be the focus of the program, especially because their audience was mostly older whites. This made the show very nostalgic, catering to commonly held beliefs of America’s ‘pure’ and ‘sophisticated’ past.²⁶

²⁴ Moist, Kevin M. 2007. “Collecting, Collage, and Alchemy: The Harry Smith Anthology of American Folk Music as Arts and Cultural Intervention.” *American Studies*, 48(4): pg.114-116

²⁵ Morgan-Ellis, Esther M. 2022. “Leslie Uggams, *Sing Along with Mitch* (1961–64), and the Reverberations of Minstrelsy.” Vol. 16 Issue 1, p47

²⁶ Morgan-Ellis, Esther M. 2022. “Leslie Uggams, *Sing Along with Mitch* (1961–64), and the Reverberations of Minstrelsy.” Vol. 16 Issue 1, p47-50

Uggams inclusion into Mitch's band of singers was a success, with Uggams skillfully producing the exact quality Mitch was looking for. Uggams was seen as a hero to the black community but became yet another lightning rod for racist criticism from whites. Even NBC, as well as her white castmates, advocated for Mitch to remove her. In one six-month period, audience members sent over 130 letters to Mitch, objecting to Uggams' inclusion on the show. The letters usually included an impassioned complaint, stating that not only the writer but a larger community of whites shared the sentiment that Uggams 'ruined the show'.²⁷ Contrary to this belief, letter writers are often considered insignificant at accurately depicting an audience's response to a TV program. They are usually those who are not particularly concerned with the program's quality itself, but a specific instance in the program which makes them *pause* and write their reaction down. The 'pause' for these people was when Uggams appeared on stage.²⁸

The reason for this pause is the nostalgic nature of the show, where Mitch would frequently position Uggams in the position of a classic movie musical protagonist. Mitch tastefully subverted the minstrel stereotypes included in these films, letting Uggams hold the spotlight as a true performer rather than stooge.²⁹ This implies stylistic similarities to

²⁷ Morgan-Ellis, Esther M. 2022. "Leslie Uggams, *Sing Along with Mitch* (1961–64), and the *Reverberations of Minstrelsy*." Vol. 16 Issue 1, p54-58

²⁸ Morgan-Ellis, Esther M. 2022. "Leslie Uggams, *Sing Along with Mitch* (1961–64), and the *Reverberations of Minstrelsy*." Vol. 16 Issue 1, p58

²⁹ Morgan-Ellis, Esther M. 2022. "Leslie Uggams, *Sing Along with Mitch* (1961–64), and the *Reverberations of Minstrelsy*." Vol. 16 Issue 1, p58-61.

the visual aesthetics of minstrel theater, since the source material Mitch was inspired by mimicked minstrel bits. Audiences conditioned to the minstrel version of US history were familiar with the scene, but the inclusion of Uggams as a non-stereotype conflicted with their understandings of their heritage. Jim Crow style performances were not commonplace at the time, but most of the audience were older whites who likely grew up with minstrelsy's depiction of American History. Uggams was a sign that an integrated future was near, but she also was an unfortunate reminder of the prejudice many Americans still held.

Today, this type of response is far less common. In fact, the idea that anybody would respond to just the inclusion of a black person in a negative way is pretty unthinkable for most people. We are far-removed from the minstrel depiction of a black person, which creates a blind spot for many. This lack of understanding was instrumental for multi-talented artist Donald Glover's 2018 music video *This is America*. In the video, Glover mimics the dance style, facial expressions, idiosyncrasies, and posture of multiple black stereotypes popularized by minstrelsy (including the original Jim Crow pose). In doing so, Glover criticizes the virality that occurs after violent attacks against African Americans at the hands of police or white supremacists; events which unmask the nature of America's racial climate but fail to bring justice to those harmed. He connects these symbols to American History using his minstrel performance

style, tying recent events to the eras of legal discrimination. Donald Glover's usage of the minstrel style is indexical, meaning that it represents minstrelsy and very closely resembles it, but does *not* function the same way. Minstrelsy in *This is America* represents a false version of American society, which has relied on the perpetuated exploitation of minority groups.

V. The New Minstrel Hypothesis- Conclusion

The original Minstrel Hypothesis is extremely appealing, as evidence continues to suggest there is a connection between minstrel theater and American popular culture. However, I would rather start the slate clean, creating a new theory considering the critiques of the original.

Minstrelsy dominated American popular culture for most of the 19th century and for much of the early 20th century. This is to be expected, as these are both eras where discrimination against black people was legal and accepted. However, the departure of the art form did not signal the end of the world minstrelsy built. As black artists gained recognition, minstrel bits were still baked into popular culture in film and (serious) music. Lester Melrose's practice of mixing genres blended authentic folk/black music with minstrel tunes, and the connection to minstrelsy forgotten. Black and anti-black art forms intertwined, making it difficult to distinguish what audiences were hearing. One might say it's a stretch to claim people like Melrose helped define the future of music, but the music

created in this era might be the most influential at shaping 20th century culture, according to historian Michael Denning: “[The latter 1920’s] changed the sound and the space of the world’s music; they stand as the central musical revolution of the 20th century, a musical “turnaround” with more profound consequences than that of the “modern” musics of the European Avant-garde.”³⁰

Although not solely focused on American music, Denning does include multiple examples of American musicians. It is also important to note that a large portion of recording history takes place in the US, since it’s where the original recording devices were invented. As such, it is reasonable to assume that American music makes up much of this ‘turnaround’ in music history.

In today’s landscape minstrelsy has mostly been swept under the rug. Technology and art have evolved to a point where it is difficult to distinguish how far we are from the past. In the sixties, during a time of great social revolution, Leslie Uggams’ performances on *Sing Along with Mitch* proved that minstrel stereotypes defined American History for a significant portion of the population. It is not likely that you would see that type of response today, but artists like Donald Glover have illustrated the connection the cultural landmark of minstrelsy has with American society. By demonstrating the problems black people face now and juxtaposing them with imagery from 1800’s Vaudeville, Glover

³⁰ Denning, Michael. 2015. *Noise Uprising: The Audiopolitics of a World Musical Revolution*. London: Verso. Introduction, pg. 3

shows the ways African Americans are *still* perceived through a lens of racism informed by minstrelsy. As it stands, minstrel tropes are hard to come by, but at any moment we might be reminded of its legacy.

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Doing Well by Doing Good: Analyzing the Financial Impact of Free Clinics on Hospital Operations

Reo Hayashizaki

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Abstract

Preventable emergency room visits cost Americans nearly \$32 billion a year.³¹ Much of the preventable emergency room visits can be attributed to uninsured or underinsured patients who do not have sufficient access to primary care physicians. These patients often hold off treatment until a disease or

³¹ KFF. (2019, July 25). *The cost of unwarranted ER visits: \$32 billion a year*. Kaiser Health News. Retrieved April 4, 2022, from <https://khn.org/morning-breakout/the-cost-of-unwarranted-er-visits-32-billion-a-year/>

illness progresses to a severe stage when treatment is often more expensive.³² The purpose of this study is to determine how the use of free or low-cost clinics impacts the financial performance of a healthcare system by lowering emergency room visits. The study is broken up into 4 stages:

Stage 1: The study first identified the adverse effects of inadequate access to healthcare by running regression analysis on aggregate health data from the Kaiser Family Foundation database. The analysis revealed correlations between inadequate access to a physician due to cost and negative outcomes in cancer deaths, rates of suicide, and self-reported health metrics ($P < 0.05$).

Stage 2: The study then utilized financial data from the American Hospital Association to compare the financial/operational performance of metropolitan hospitals with and without indigent care clinics. Hospitals with indigent care clinics had lower emergency room visits, higher net patient revenue, lower costs of uncompensated care, and lower uncollectible accounts than their non-indigent counterparts when figures were adjusted on a per-million-dollars-of-patient-revenue and per admission basis.

Stage 3: The study compared the 2018 and 2019 financial records of hospitals that opened an indigent care clinic in 2019. The comparison demonstrated a 2.92% decrease in the number of emergency room visits, but the cost of

³² Hsia, R., & Niedzwiecki, M. (2017). Avoidable emergency department visits: a starting point. *National Library of Medicine*, 642–645. <https://doi.org/10.1093/intqhc/mzx081>

uncompensated care increased by over 5%, yielding lower net income for 2019.

Stage 4: The study finally compared Integris Baptist Hospital (indigent) and SSM Health St. Anthony's Hospital (no indigent) to compare the financial performance of two similarly sized hospitals located in Oklahoma City. The comparison showcased a decisive advantage for Integris Baptist which had half the emergency room visits, less than a quarter of bad debt expense, and 20% less facility inpatient days when the figures were adjusted for admissions.

Conclusion: The study demonstrated a financial advantage for hospitals with indigent care clinics in the form of lower emergency room visits and lower uncompensated care costs when evaluated on a patient revenue basis and demonstrated a slightly weaker relationship on a per admission basis. However, a causal relationship between the factors was not established in this paper, and future research can be conducted to evaluate a hospital's financial performance three years before and three years after the implementation of an indigent care clinic.

Introduction

The American health care system has been at the center of public scrutiny for decades. Despite spending 19.7% - compared to an average of 10.3% in developed countries- of gross domestic product (GDP) on healthcare, the United States has one of the highest rates of infant mortality, heart disease, lung disease, STDs, and drug-related mortality

among 16 similarly developed countries.³³ The high costs, disparate impact, and lack of routine care have lead policy makers, academics, and ordinary citizens to ask: why do we pay so much for worse health outcomes?

A comprehensive answer to this particular question is vast and complicated with much room for debate, so it will not be the subject of this paper. However, current academic literature generally agree on one particular cause: the lack of preventative care.³⁴ The United States' healthcare system is focused on treatment after the onset of a disease rather than proactively managing health to prevent it. This 'disease treatment' mentality is most prevalent among the uninsured and underinsured patients who often postpone treatment until further into the disease progression, making treatment more costly and potentially more dangerous. Furthermore, uninsured patients often overutilize the emergency

³³ CMS. (2021, December 15). *NHE Fact Sheet*. Retrieved April 4, 2022, from <https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/NHE-Fact-Sheet>

National Research Council. (2013). *US Health in International Perspective: Shorter Lives, Poorer Health*. NCBI. Retrieved April 4, 2022, from <https://www.ncbi.nlm.nih.gov/books/NBK154469/>

WHO. (n.d.). *Current health expenditure (CHE) as percentage of gross domestic product (GDP) (%)*. World Health Organization. Retrieved April 4, 2022, from [https://www.who.int/data/gho/data/indicators/indicator-details/GHO/current-health-expenditure-\(che\)-as-percentage-of-gross-domestic-product-\(gdp\)-\(-\)](https://www.who.int/data/gho/data/indicators/indicator-details/GHO/current-health-expenditure-(che)-as-percentage-of-gross-domestic-product-(gdp)-(-))

³⁴ Cutler, D. (2020). *The World's Costliest Health Care*. Harvard Magazine. Retrieved April 4, 2022, from <https://www.harvardmagazine.com/2020/05/feature-forum-costliest-health-care>

Galarraga, J. E., & Pines, J. M. (2016). Costs of ED episodes of care in the United States. *The American Journal of Emergency Medicine*, 34(3), 357–365. <https://doi.org/https://doi-org.ezproxy.lib.ou.edu/10.1016/j.ajem.2015.06.001>

room because of financial barriers preventing patients from seeing a primary care physician or visiting an urgent clinic.³⁵

Estimates of avoidable emergency room visits range from 3.3% - 17% of all ER visits, incurring billions of dollars of unnecessary medical expenses.³⁶

Previous studies have demonstrated that homeless individuals, who are very likely to be uninsured, cost hospitals nearly \$18,500 annually in emergency room visits per person.³⁷

Avoidable emergency room visits have ramifications beyond patients. Uninsured patients who use the emergency room (ER) contribute to the growing level of uncompensated care for hospitals (see fig. 1).³⁸ The rise in the levels of uncompensated care forces hospitals into cost shifting behavior that raise prices for insured patients.³⁹ The increased prices, in turn, further discourage healthcare utilization which may make preventable ER visits more likely.

³⁵ Hsia, R., & Niedzwiecki, M. (2017). Avoidable emergency department visits: a starting point. *National Library of Medicine*, 642–645. <https://doi.org/10.1093/intqhc/mzx081>

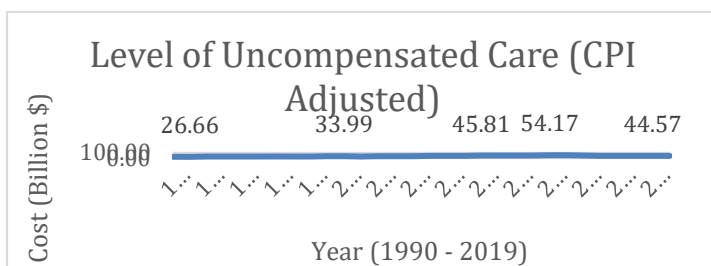
³⁶ AHRQ. (2016, July). *Chartbook on Care Coordination*. Retrieved April 4, 2022, from <https://www.ahrq.gov/research/findings/nhqrdc/chartbooks/carecoordination/measure2.htm>

³⁷ Garrett, D. G. (2012). The Business Case for Ending Homelessness: Having a Home Improves Health, Reduces Healthcare Utilization and Costs. *National Library of Medicine*, 17–19.

³⁸ WRDS. (n.d.). Wharton Research Data Services. Retrieved April 4, 2022, from <https://wrds-www.wharton.upenn.edu/>

³⁹ Morrissey, M. A. (1996). Hospital cost shifting, a continuing debate. *National Library of Medicine*, 1–13.

This vicious cycle brings us to the principal topic of this paper. Can hospitals reduce the number of ER visits and thereby increase financial performance by providing free or low-cost preventative care? A previous study claimed that for every \$1 spent on preventative care, approximately \$71 would be saved in healthcare value.⁴⁰ However, the study failed to specify who primarily benefited from the \$71 in savings. Would it be in the best interests of the hospital to fund a free clinic?



Methodology

This report will analyze the financial impact of free clinics on hospital performance by analyzing financial data from the American Hospital Association⁴¹ database from 2017 to 2019 in addition to 2019 health statistics collected from the

⁴⁰ Barry, K., McCarthy, M., Buckley, J., Jacques, S., & Johnson, H. (2019). Four Years of CHEER: Cost and QALY Savings of a Free Nurse-run Walk-in Clinic Serving an Uninsured, Predominantly Spanish-speaking Immigrant Population in Providence. *Journal of Health Care for the Poor and Underserved*, 30(2), 806–819. <https://doi.org/10.1353/hpu.2019.0057>

⁴¹ WRDS. (n.d.). Wharton Research Data Services. Retrieved April 4, 2022, from <https://wrds-www.wharton.upenn.edu/>

Kaiser Family Foundation⁴² database. Data from 2020 and 2021 were deliberately omitted from analysis to exclude the effects of the Covid-19 pandemic on hospital operations. The report is divided into four distinct stages.

Stage 1: Medical impact of inadequate access to primary care physicians. State health metrics – which include per capita suicide rate, cancer deaths, and overall health rating – from KFF were analyzed using linear and logistical regression with the *No access to doctor due to cost* metric, which measures the percentage of the state population that had not visited a doctor in the past 12 months due to financial difficulties, set as the independent variable. Only results with R Squared of 0.65 or above and a P-Value < 0.05 were deemed statistically significant.

Stage 2: Financial comparison of hospitals with and without indigent clinics. Hospital financial data was aggregated from the AHA database to measure ten key metrics of hospital performance: (1) Admissions (2) Inpatient Days (3) Medicaid Days (4) ER Visits (5) Case Mix (6) Net Revenue (7) Uncompensated Care (8) Patient Revenue (9) Uncollectible Receivables (10) Total Net Income. The results were adjusted to present

⁴² KFF. (2019, June 25). *State Health Facts*. Retrieved April 4, 2022, from <https://www.kff.org/statedata/>

data on a per admitted patient and per \$1,000,000 revenue basis to account for different hospital sizes. The unadjusted averages are presented in the Appendix. The sampled hospitals consist of medical facilities located within a metropolitan area that have an emergency department. Rural hospitals were excluded from the sample due to their smaller size relative to metropolitan hospitals and their tendency to be unprofitable. The data included 738 metropolitan hospitals with indigent care clinics and 1,531 metropolitan hospitals without indigent care clinics.

Stage 3: Effect of in addition care clinics one year after opening

The study then analyzed financial data from 167 hospitals that opened an indigent care clinic in fiscal year 2019 to analyze the clinic's effect on hospital performance. The sample was drawn from all hospitals within the United States with an emergency department and was not filtered for metropolitan hospitals to maintain a sample size large enough for this analysis.

Stage 4: Integris Baptist v. SSM St. Anthony's comparison.

The report took an in-depth look into the financial performance of these two organizations by using financial data from IRS Form 990s. These two hospitals are comparable medical facilities, in terms of number of hospital beds and total revenue,

located in Oklahoma City. Their close proximity suggests that they serve a similar patient population and face the same regulatory/reporting laws. However, the key difference is that Integris Baptist has one of the largest free clinics in Oklahoma while SSM St. Anthony's has no reported indigent care clinic.⁴³ This comparison isolates the effect of indigent clinics on financial performance as much as possible.

Results/Discussion

Stage 1: Medical impact of inadequate access to primary care physicians.

Using linear and logistical regression, the analysis yielded the following correlations (see Appendix pgs. 16-19 for a full breakdown of each figure):

1. For every 1% increase in a state's uninsurance population, the percentage of adults who forego care due to cost increases by 0.48%.
2. For every 1% increase in a state's uninsurance population, the number of suicide deaths increase by 0.73%.
3. For every 1% increase of people that report not having access to a doctor due to cost, there is a corresponding 0.38% increase in the rating of Poor in self-reported health perception.

⁴³ AHA. (2012, February 22). *Integris Health - Integris Baptist Community Clinic*: AHA. Retrieved April 8, 2022, from <https://www.aha.org/case-studies/2012-02-22-integris-health-integris-baptist-community-clinic>

4. For every 1% increase of people that report not having access to a doctor due to cost, there is a corresponding 6.85% increase in the number of cancer deaths in a state.

Discussion: Analysis of KFF data demonstrates a positive correlation between limited access to primary care physicians/the proportion of uninsured people in a given state and several state health metrics. While the results by no means demonstrate causation, the analysis fits a basic intuition of health care access: people with less access to medical care often have worse health outcomes. This finding, while not groundbreaking, lends credence to the humanitarian and ethical reasons for providing access to basic care.

Stage 2: Financial comparison of hospitals with and without indigent clinics.

Results: Metropolitan Admission Adjusted Average

Metric	Indigent	No Indigent
Total hospital beds	0.02	0.03
Admissions, (As Hosp)	1.00	1.00
Total facility inpatient days	5.32	5.94
Total facility Medicaid days	1.32	1.35
Emergency room visits	3.89	4.33
Case Mix	1.73*	1.63*
	\$ 16,815	\$ 11,602

Total patient revenues		
Net patient revenues less operating expenses	\$ (2,350)	\$ (1,316)
Cost of uncompensated care	\$ 1,321	\$ 1,135
Sum of unreimbursed and uncompensated care	\$ 2,077	\$ 1,770
Uncollectable Receivables	\$ (4,626)	\$ (6,099)
Total Net Income	\$ 1,833	\$ 829

* Indicates unadjusted figures

Metropolitan Revenue Adjusted Average (Per
million dollars)

Metric	Indigent	No Indigent
Total hospital beds	1.26	2.21
Admissions, (As Hosp)	59	86
Total facility inpatient days	316	512
Total facility Medicaid days	78	116
Emergency room visits	232	373
Case Mix	1.73*	1.63*
	\$	\$
Total patient revenues	1,000,000	1,000,000

Net patient revenues less operating expenses	\$ (139,732)	\$ (113,440)
Cost of uncompensated care	\$ 78,546	\$ 97,815
Sum of unreimbursed and uncompensated care	\$ 123,505	\$ 152,549
Uncollectable Receivables	\$ (275,110)	\$ (525,724)
Total Net Income	\$ 109,009	\$ 71,477

Discussion: Hospitals with an indigent care clinic were significantly larger than their non-indigent counterpart in almost every metric. Therefore, in order to make the comparison useful, the averages were adjusted for patient revenue and total admissions separately. The results from the metropolitan hospitals demonstrate that on average, hospitals with indigent care clinics have lower emergency room visits, less total inpatient days, and less costs associated with unreimbursed or uncompensated care. This difference is even more stark among indigent metropolitan hospitals which outperform non-indigent hospitals in 9 of the 12 metrics.

Stage 3: Effect of indigent care clinic year of opening

In order to better assess whether a causal relationship between indigent care clinics and increased financial performance exists, the study examined the financial data of 167 hospitals that

opened an indigent care clinic in 2019 to compare the financial performance before (2018) and after (2019) the opening of a new clinic. This group shall be collectively referred to as Special Cases. The results are summarized below.

Special Cases (2018 – 2019)

Metric	2018	2019
Total hospital beds	182	184
Admissions, (As Hosp)	8,781	8,692
Total facility inpatient days	43,344	43,966
Total facility Medicaid days	9,428	10,545
Emergency room visits	40,339	39,160
Case Mix	1.67	1.68
Net patient revenues less total operating expenses	\$ 7,016,688	\$ (4,160,063)
Total patient revenues	\$ 130,625,487	\$ 131,371,497
Cost of uncompensated care	\$ 8,365,783	\$ 8,787,718
Sum of unreimbursed and uncompensated care	\$ 16,366,324	\$ 16,330,737
Uncollectable Receivables	\$ (64,675,536)	\$ (74,952,889)
Total Net Income	\$ 22,879,724	\$ 19,349,593

Discussion: The year directly after the opening of an indigent care clinic yielded mixed results. The total amount of uncompensated care remained relatively unchanged, and the number of emergency room visits decreased by approximately 2.9%. However, metrics like total uncollectible receivables, cost of uncompensated care, and net operating revenue showed adverse effects. However, the adverse trend in the aforementioned metrics is consistent with the general market

downturn of No Indigent hospitals between 2018-2019 (see Appendix pgs. 14-15). In fact, total net income for Special Cases decreased by 15%, which is significantly lower than the 37% decline experienced by the broader group of hospitals. This finding suggests that indigent care clinics do not have a significant impact on hospital financial performance the year immediately after its implementation.

Hospitals in this sample saw a reduction in the average emergency room visits of 2.92% or 1,179 visits compared to a 3% increase in the No Indigent hospital category. Using an average emergency room visit cost of \$1,389, these hospitals saved an average of \$1,637,631 dollars in emergency room visits in the first year.⁴⁴

Stage 4: Integris Baptist v. SSM St. Anthony's comparison (2015-2019)

SSM St. Anthony's (No Indigent) versus Integris Baptist (Indigent)

Admission Adjusted Average

Metric IRS (Adjusted)	Integris Baptist	SSM St. Anthony's
Total hospital beds	0.02	0.03
Admissions, (As Hosp)	1.00	1.00
Total facility inpatient days	5.95	7.10

⁴⁴ NAFC. (2020, May). *2020 NAFC Annual Data Collection Report*. Retrieved April 4, 2022, from <https://nafclclinics.org/wp-content/uploads/2021/09/NAFC-Data-Collection-Report-2020.pdf>

Total facility Medicaid days	-	-
Emergency room visits	2.79	5.47
Case Mix	2.19*	1.87*
Net patient revenues	25,841	24,351
Net Income	1,129	703
Bad Debt Expense	357	2,133
Legal	0.33	26.35

* Indicates unadjusted figures

Discussion: While the two hospitals in question are similar in revenue and patient admission, Integris is slightly larger, so the study adjusted the table to compare it on a per admission basis. The preceding comparison shows significant advantages for Integris including only half the emergency room visits and less than quarter of the bad debt expense of Saint Anthony's. This analysis suggests that an indigent care clinic is correlated with better financial and operational performance. One point of observation is that the legal expense for Integris is significantly lower than SSM health. While the exact cause could not be determined from the given data, a contributor could be the reduced reliance on lawyers to collect unpaid services through litigation.

Medical debt collection rates have been on a rise in Oklahoma since 2019.⁴⁵

Limitations and Opportunities for Future Research

This study utilized comparative analysis to determine the general financial impact of indigent care clinics, but this study could not establish a causal relationship between these two variables. In the future, further research is needed to compare the financial performance of a hospital before and after opening a clinic. The one-year analysis done in Stage 2 of the study is most likely inadequate due to the short time horizon. Preventative care is done over the course of several years and requires frequent, established relationships with the primary care physician. The author does not believe this is possible in just one year. The data available in the AHA database only spans from 2017 to 2019. Furthermore, the data compiled from AHA and the IRS had inconsistencies in the reported figures. The advisory nature and loose auditing standards of each data source suggest that the analysis may be partially flawed. The only way to ameliorate this situation is to get internal data, but that would be extremely time-consuming and costly to accomplish.

⁴⁵ Brown, T. (2019, August 7). *Oklahoma Hospitals Sue Thousands Each Year Over Unpaid Medical Bills*. Oklahoma Watch. Retrieved April 4, 2022, from <https://oklahomawatch.org/2019/08/07/oklahoma-hospitals-sue-thousands-each-year-over-unpaid-medical-bills/>

Conclusion

The results of this study suggest that integrated delivery networks that provide indigent care services to uninsured and underinsured patients are correlated with higher performance metrics. When comparing two similarly sized hospitals in Oklahoma City, the data suggests that the hospital with an indigent care clinic has much lower costs of uncompensated care. This result translates into higher net income per admitted patients. Integris' also had a notably lower emergency room visit count despite having a much higher case mix (a measure to evaluate the severity of an illness). Therefore, metropolitan hospitals may benefit financially by providing free preventative care in order to offset unnecessary emergency room visits. This effect is especially accentuated for 501(c)(3) nonprofit organizations that are legally required to provide and report community benefits to maintain their tax-exempt status. According to the National Association the Free Clinics, the average operating cost of a free clinic is approximately \$500,000 a year.⁴⁶ While the free clinics for hospitals are likely to be more expensive due to a higher usage rate and more services available, the tax savings and unnecessary emergency room visits may be able to justify funding a free clinic.

There are other benefits of a free clinic that are harder to quantify. Free clinics can also serve as a facility to help uninsured patients get Medicaid

⁴⁶ NAFC. (2020, May). *2020 NAFC Annual Data Collection Report*. Retrieved April 4, 2022, from <https://nafcclinics.org/wp-content/uploads/2021/09/NAFC-Data-Collection-Report-2020.pdf>

health coverage. In one 2017 study, 50% of uninsured patients out of free clinic were eventually enrolled in the Medicaid program, providing some compensation for their health care needs.⁴⁷ Free clinics also can help reduce racial disparities in healthcare. Nearly 55% of all patients who utilize free clinics are African American or Hispanic despite these groups comprising approximately 31% of the US general population.⁴⁸ Furthermore, providing free clinics can provide the participating hospitals with a positive reputation from the surrounding communities. In the case of free clinics, this is a relatively unique opportunity where the profit motivations of a hospital are aligned with the general healthcare needs of the community. The implementation of free clinics has strong potential to have positive financial, ethical, and health impact on all parties involved.

⁴⁷ McGeehan, M., DeMaria, R., Charney, P., & Batavia, A. S. (2017). Insurance Enrollment at a Student-Run Free Clinic After the Patient Protection and Affordable Care Act. *National Library of Medicine*, 42(4), 785–790. <https://doi.org/10.1007/s10900-017-318-7>

⁴⁸ NAFC. (2020, May). *2020 NAFC Annual Data Collection Report*.

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<https://www.ncbi.nlm.nih.gov/books/NBK154469/>

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WHO. (n.d.). *Current health expenditure (CHE) as percentage of gross domestic product (GDP) (%)*. World Health Organization. Retrieved April 4, 2022, from [https://www.who.int/data/gho/data/indicators/indicator-details/GHO/current-health-expenditure-\(che\)-as-percentage-of-gross-domestic-product-\(gdp\)-\(-\)](https://www.who.int/data/gho/data/indicators/indicator-details/GHO/current-health-expenditure-(che)-as-percentage-of-gross-domestic-product-(gdp)-(-))

Appendix

Result: Average of all Metropolitan Hospitals

Metric	Indigent	No Indigent
Total hospital beds	310	123
Admissions, (As Hosp)	14,652	4,820
Total facility inpatient days	77,901	28,607
Total facility Medicaid days	19,316	6,500
Emergency room visits	57,065	20,850
Case Mix	1.73	1.63
	\$	\$
Total patient revenues	246,370,734	55,920,986
	\$	\$
Net patient revenues less operating expenses	(34,425,994)	(6,343,655)
	\$	\$
Cost of uncompensated care	19,351,376	5,469,888
	\$	\$
Sum of unreimbursed and uncompensated care	30,428,090	8,530,675
	\$	\$
Uncollectable Receivables	(67,778,966)	(29,398,984)
	\$	\$
Total Net Income	26,856,542	3,997,036

Admission Adjusted All Hospitals

Metric	Indigent	No Indigent
Admissions, (As Hosp)	1	1
Total facility inpatient days	5.44	6.29
Emergency room visits	3.79	4.23
	\$	\$
Total Medicaid Costs	4,742	4,359
	\$	\$
Net patient revenues less total operating expenses	(1,199)	(771)
	\$	\$
Total patient revenues	14,582	14,598
	\$	\$
Cost of uncompensated care	1,406	1,353
	\$	\$
Sum of unreimbursed and uncompensated care	2,540	2,333
	\$	\$
Uncollectable Receivables	(4,476)	(6,415)
	\$	\$
Total Net Income	2,219	1,947

Comparison

Metric IRS	Integris Baptist	SSM St. Anthony's
Total hospital beds	597	625
Admissions, (As Hosp)	28,545	22,935
Total facility inpatient days	169,935	162,724
Total facility Medicaid days		
Emergency room visits	79,761	125,505
Case Mix	2.19	1.87

Net patient revenues	737,626,741	558,496,628
Net Income	32,219,237	16,133,189
Bad Debt Expense	10,189,298	48,925,191
Legal	9,454	604,322

Indigent Hospitals 2018 - 2019

Metric	2018	2019
Total hospital beds	107	108
Admissions, (As Hosp)	3,897	3,936
Total facility inpatient days	24,510	24,747
Emergency room visits	17,028	17,520
Case Mix	0.74	0.74
	\$	\$
Net patient revenues less total operating expenses	(1,876,627)	(4,595,158)
	\$	\$
Total patient revenues	4,143,305	4,249,569
	\$	\$
Cost of uncompensated care	6,598,833	6,810,368
	\$	\$
Sum of unreimbursed and uncompensated care	6,598,833	6,810,368
	\$	\$
Uncollectable Receivables	(23,854,990)	(24,058,037)
	\$	\$
Total Net Income	6,002,536	3,774,757

Health Perception

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.877169374
R Square	0.76942611
Adjusted R Square	0.754708628
Standard Error	0.016281045
Observations	51

ANOVA					
	df	SS	MS	F	Significance F
Regression	3	0.041573752	0.013857917	52.27973734	5.20687E-15
Residual	47	0.012458405	0.000265072		
Total	50	0.054032157			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1.210554037	0.145471749	8.321574773	8.47088E-11	0.917902626	1.503205448	0.917902626	1.503205448
2019 No Doctor	0.387658518	0.179690079	2.157372958	0.036120873	0.026168706	0.74914833	0.026168706	0.74914833
2019 Uninsured	-0.14513446	0.129134672	-1.123900013	0.266763199	-0.404919912	0.114650992	-0.404919912	0.114650992
Life expectancy	-0.01410298	0.001726336	-8.169315497	1.42512E-10	-0.01757592	-0.010630041	-0.01757592	-0.010630041

Uninsured v. No Doctor

Regression Statistics	
Multiple R	0.83457075
R Square	0.696508336
Adjusted R Square	0.690314629
Standard Error	0.010922878
Observations	51

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	0.013416826	0.013416826	112.4541875	2.76772E-14
Residual	49	0.005846154	0.000119309		
Total	50	0.01926298			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.053781282	0.003855663	13.94864721	1.09404E-18	0.046033037	0.061529527	0.046033037	0.061529527
Uninsured	0.482641102	0.045513107	10.60444188	2.76772E-14	0.391179088	0.574103115	0.391179088	0.574103115

Suicide Rates

Regression Statistics	
Multiple R	0.853075592
R Square	0.727737965
Adjusted R Square	0.667973128
Standard Error	2.82966542
Observations	51

ANOVA					
	df	SS	MS	F	Significance F
Regression	9	877.4896008	97.49884453	12.17669124	4.39841E-09
Residual	41	328.287262	8.007006389		
Total	50	1205.776863			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	28.66266485	37.15010311	0.771536616	0.444813117	-46.36349043	103.6888201	-46.36349043	103.6888201
Unmet	-123.5390111	47.98272864	-2.57465581	0.013741936	-220.4420975	-26.63592471	-220.4420975	-26.63592471
Alcohol Unmet	213.3039786	62.81618684	3.395684924	0.00153157	86.44411571	340.1638416	86.44411571	340.1638416
Unmet Drug	-60.77232385	130.5879972	-0.4653745	0.644125831	-324.5001344	202.9554866	-324.5001344	202.9554866
Mental Illness	14.21762118	37.48236644	0.379314929	0.706411541	-61.47955352	89.91479589	-61.47955352	89.91479589
Life expectancy	-0.696653015	0.442313449	-1.575021099	0.122937411	-1.589923148	0.196617117	-1.589923148	0.196617117
Poverty rate	-28.97658382	26.90426287	-1.077025747	0.287765315	-83.31084496	25.35767732	-83.31084496	25.35767732
2019 Uninsured	73.18614535	16.39068021	4.46510727	6.14722E-05	40.08449514	106.2877956	40.08449514	106.2877956
Depression	102.530491	32.03559637	3.200517632	0.002648898	37.83329166	167.2276904	37.83329166	167.2276904
Thoughts of suicide	379.7074892	104.1769241	3.644832984	0.000745847	169.3179228	590.0970556	169.3179228	590.0970556

Cancer Deaths

Regression Statistics	
Multiple R	0.879276468
R Square	0.773127108
Adjusted R Square	0.747919009
Standard Error	0.227141353
Observations	51

ANOVA					
	df	SS	MS	F	Significance F
Regression	5	7.911762186	1.582352437	30.66979004	1.92926E-13
Residual	45	2.321693744	0.051593194		
Total	50	10.23345593			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	4.230134965	4.263808699	0.992102429	0.326452466	-4.357616584	12.81788651	-4.357616584	12.81788651
Smoking	0.095967359	1.880142832	0.05104259	0.959517486	-3.690834691	3.882769409	-3.690834691	3.882769409
2019 Uninsured	-4.684845309	1.837955543	-2.548943758	0.014285199	-8.386677797	-0.98301282	-8.386677797	-0.98301282
Total Cancer patients	1.19362E-05	1.17644E-06	10.14606396	3.29533E-13	9.56677E-06	1.43057E-05	9.56677E-06	1.43057E-05
Life expectancy	-0.017196928	0.048621222	-0.353691819	0.725221638	-0.115125096	0.080731239	-0.115125096	0.080731239
2019 _All Adults	6.849481428	2.907352497	2.355917088	0.02289355	0.993772912	12.70518994	0.993772912	12.70518994

Superhero Hearing: A Preliminary Report of Audiological Characteristics in Persons with Misophonia

Avery Moore

Literature Review

Misophonia is a disorder distinguished by hypersensitivity to specific sounds that provoke an irrational adverse emotional reaction.⁴⁹ These sounds are referred to as “trigger” sounds. The auditory stimuli that cause these emotional outbursts are specific to each individual with misophonia. However, there is a trend in the kinds of trigger sounds. They are typically repetitive human-made noises such as smacking, chewing, tapping, and pen clicking.⁵⁰ Reactions to the stimuli do not appear to be affected by the loudness of the misophonic sounds. Instead, the pattern or meaning of the sound prompts a negative response.⁵¹ When a person with misophonia hears one of their triggers, the individual experiences a range of emotions, including but not limited to: irritation, anger, anxiety, overstimulation, and disgust.⁵² Misophonia

⁴⁹ Swedo, S. E., Baguley, D. M., Denys, D., Dixon, L. J., Erfanian, M., Fioretti, A., Jastreboff, P. J., Kumar, S., Rosenthal, M. Z., Rouw, R., Schiller, D., Simner, J., Storch, E. A., Taylor, S., Werff, K. R., Altman, C. M., & Raver, S. M. (2022). Consensus definition of Misophonia: A delphi study. *Frontiers in Neuroscience*, 16. <https://doi.org/10.3389/fnins.2022.841816>

⁵⁰ Edelstein, M., Brang, D., Rouw, R., & Ramachandran, V. S. (2013). Misophonia: Physiological investigations and case descriptions. *Frontiers in Human Neuroscience*, 7. <https://doi.org/10.3389/fnhum.2013.00296>

⁵¹ Swedo et al., 2022

⁵² Brout, J. J., Edelstein, M., Erfanian, M., Mannino, M., Miller, L. J., Rouw, R., Kumar, S., & Rosenthal, M. Z. (2018). Investigating Misophonia: A review of the empirical literature, clinical implications, and a research agenda. *Frontiers in Neuroscience*, 12. <https://doi.org/10.3389/fnins.2018.00036>

becomes a more significant problem when it impacts the person's ability to function in society. This can manifest in their occupational, academic, and social lives and cause them to avoid specific environments or not perform well in school or their jobs.⁵³ For example, a student taking an exam may be triggered by another student chewing gum, thus causing them to perform poorly on their test. In more extreme cases, patients may not leave their homes to avoid the sounds at all costs.

Several studies have attempted to estimate the prevalence and incidence of misophonia in various age groups. Due to the need for more consensus on a definition of misophonia and differences in measurement tools, it is premature to estimate the prevalence of misophonia worldwide. One smaller study found that twenty percent of 483 undergraduates reported significant symptoms of misophonia.⁵⁴ However, a more recent large-scale study of 2,519 people in Germany found that about five percent of the general population suffers from misophonia.⁵⁵ Still, more investigation is necessary before a consensus can be reached.

When misophonia was first named in 2001 by Jastreboff and Jastreboff, they were originally studying hyperacusis and noticed patients had adverse reactions to specific noises regardless of decibel level.⁵⁶ The Jastreboffs coined the term

⁵³ Swedo et al., 2022

⁵⁴ Wu, M. S., Lewin, A. B., Murphy, T. K., & Storch, E. A. (2014). Misophonia: Incidence, phenomenology, and clinical correlates in an undergraduate student sample. *Journal of Clinical Psychology*, 70(10), 994–1007. <https://doi.org/10.1002/jclp.22098>

⁵⁵ Jakubowski, E., Müller, A., Kley, H., de Zwaan, M., & Müller-Vahl, K. (2022). Prevalence and clinical correlates of misophonia symptoms in the general population of Germany. *Frontiers in Psychiatry*, 13. <https://doi.org/10.3389/fpsyt.2022.1012424>

⁵⁶ Jastreboff, M.M. & Jastreboff, Pawel. (2001). Component of decreased sound tolerance: Hyperacusis, misophonia, phonophobia. *ITHS News Letter*. 2. 5-7.

misophonia due to its literal Greek translation of “strong dislike of sound.” They theorized that the etiology of misophonia stems from increased connections between the limbic, auditory, and autonomic nervous systems.⁵⁷ While this is a step towards understanding the disorder, there is limited research investigating the reasoning behind this condition. As more research is conducted, connections are being made about potential neuropathies, mechanisms, and etiologies.

Schröder et al. (2014) started the process of defining potential neural mechanisms of misophonia. Their main finding was that the amplitude of the N1 peak in misophonic patients was significantly lower compared to the control group.⁵⁸ N1 is a component of auditory event-related potentials (ERPs) linked with auditory attention and the ability to detect abrupt changes in sensory input.⁵⁹ This implies that people with misophonia have a deficit in processing auditory information. Schröder et al. also speculated that the diminished N1 amplitude was due to comorbid psychiatric conditions.⁶⁰ Their findings do not imply an absolute link between low N1 and misophonia, as more research is required to rule out other psychiatric conditions.

One recent study conducted from the audiological lens found that hearing loss in high

⁵⁷ Jastreboff, M., & Jastreboff, P. (2014). Treatments for decreased sound tolerance (hyperacusis and Misophonia). *Seminars in Hearing*, 35(02), 105–120. <https://doi.org/10.1055/s-0034-1372527>

⁵⁸ Schröder, A., van Diepen, R., Mazaheri, A., Petropoulos-Petalas, D., Soto de Amesti, V., Vulink, N., & Denys, D. (2014). Diminished N1 auditory evoked potentials to oddball stimuli in misophonia patients. *Frontiers in Behavioral Neuroscience*, 8. <https://doi.org/10.3389/fnbeh.2014.00123>

⁵⁹ Brout et al., 2018

⁶⁰ Schröder, A., van Diepen, R., Mazaheri, A., Petropoulos-Petalas, D., Soto de Amesti, V., Vulink, N., & Denys, D. (2014). Diminished N1 auditory evoked potentials to oddball stimuli in misophonia patients. *Frontiers in Behavioral Neuroscience*, 8. <https://doi.org/10.3389/fnbeh.2014.00123>

frequencies or a steep slope correlates with a reduced risk of misophonia.⁶¹ The hearing loss at the higher frequencies lowers the chances of the person with misophonia hearing the trigger sound.⁶² This finding indicates that misophonia is potentially correlated with higher frequencies. Additionally, Aazah et al. (2022) found that misophonia is present regardless of hearing loss or normal hearing.

Specific Aims

Misophonia is a neurophysiological condition that causes heightened autonomic arousal and negative emotional response to specific sounds. Research into misophonia and its complexities is still in the early stages, as it was first defined within the last twenty-two years. As more research is conducted, theories about the neuropathology of misophonia are being suggested, and clinicians are gaining more insight into a disorder that impacts many. It is vital to continue this research to help health professionals understand misophonia and learn how to serve their patients best. However, potential causes involving the hearing mechanism itself remain unexplored. Previous research recognizes potential neurological differences in their autonomic arousal system and neuronal responses. Few, if any, studies include research conducted from an audiological lens.

⁶¹ Aazh, H., Erfanian, M., Danesh, A. A., & Moore, B. C. (2022). Audiological and other factors predicting the presence of misophonia symptoms among a clinical population seeking help for tinnitus and/or hyperacusis. *Frontiers in Neuroscience*, 16. <https://doi.org/10.3389/fnins.2022.900065>

⁶² Aazh et al., 2022

The long-term goal of this paper is to help eliminate this gap in knowledge by studying the audiological characteristics of misophonia patients and creating an audiological profile for them. The specific objectives of this study are to gain a further understanding of the audiological features of people with misophonia and link those features to possible causes of misophonia. We have been collecting audiological data from people with misophonia to analyze and observe potential differences in hearing abilities between individuals with and without misophonia. We were curious if other physiological components contributed to the hypersensitivity of individuals with misophonia. It was hypothesized that people with misophonia can hear at lower decibel levels in higher frequencies than the average person. In other words, they have “superhero” hearing. Patients become empowered by learning more possible etiologies of this disorder, and researchers can develop treatments to help misophonic populations further.

Methodology

Participants

Seventeen participants ranging from eighteen to twenty-two ($M = 19$, $SD = 1.24$) were recruited through an online research pool comprised of undergraduate students at the University of Oklahoma in Norman, Oklahoma. The study was conducted in partnership with the Department of Psychology. The respondents anonymously filled out an online Spectrum Characteristics Survey

(SCS) that screened for traits found in people with misophonia and other comorbid conditions. The SCS included the Misophonia Questionnaire (MQ), which is a validated self-report questionnaire containing three sections. The three parts of the MQ evaluate trigger sounds, emotional and behavioral reactions to the triggers, and severity of sensitivity to the sounds.⁶³ They could provide contact information to be considered for a follow-up study at the respondent's discretion. If randomly selected to continue, the participants would be contacted to participate in a follow-up study. Subjects who decided to return for further assessment were compensated with a forty-dollar gift card. To control bias, the audiology team did not know whether the subject had misophonia until the participant arrived at the lab and completed an initial interview.

In-Take Form

Upon arrival at the facility, subjects were asked questions in an in-take form. A research assistant described the definitions of tinnitus, hyperacusis, and misophonia to the participants and asked if they experienced any symptoms. If the subject reported experiencing one of the three disorders, the assistant would follow up with more questions. For tinnitus, the subject would note a tinnitus ear, a worse ear, any volume fluctuations, onset, how it sounds, and the severity. The participant would also report the onset, physical discomfort, trigger sounds, and severity of

⁶³ Wu et al., 2014

hyperacusis. For misophonia, the subject would report trigger sounds, the onset of the disorder, how they felt when they heard the trigger sounds and the sensitivity towards the sounds.

Audiological Workup

After completing the in-take form, the participant would be taken to complete an audiological workup. The workup included tympanometry, loudness discomfort level, and pure tone thresholds at 250, 500, 1,000, 2,000, 4,000, 8,000, 9,000, 10,000, 11,200, 12,500, 14,000, 16,000, and 20,000 Hz. Tympanometry helps determine the middle ear's integrity and tests the middle ear's pressure, amplitude, volume, and width. The loudness discomfort level signifies the decibel level at which the person cannot tolerate sound for more than a few seconds. The subject's loudness discomfort levels were evaluated at 500, 1,000, 2,000, and 4,000 Hz and speech levels. Each test was conducted in both the right and left ears. If the subject reported tinnitus, the workup would also include tinnitus pitch matching, loudness matching, residual inhibition, and minimal masking.

Data Analysis

IBM SPSS Statistics was used to compute all data analysis. Descriptive statistics were calculated for each pure tone threshold, pure tone averages, and loudness discomfort levels. For each pure tone frequency tested, descriptive statistics were calculated individually for the right and left

ears and both ears combined. The descriptive statistics included mean, median, mode, standard deviation, variability, and range calculations.

Results

Frequency (Hz)	Control Group Mean (dB HL)	Misophonia Group Mean (dB HL)
250	19.17	11.61
500	15	10.7
1,000	10.83	7.68
2,000	8.33	7.32
4,000	5.83	5.71
8,000	9.16	4.29
9,000	7.5	0.36
10,000	5	1.79
11,200	15.83	1.61
12,500	10	-2.5
14,000	6.66	-1.25
16,000	0.83	2.14
18,000	-1.67	-1.61
20,000	5	-6.25

Figure 1.1: Mean pure tone thresholds for right and left ears combined in people with and without misophonia.

Descriptive statistics were used to test the hypothesis that people with misophonia have better than average hearing at higher frequencies than those without misophonia. Generally, it was found that individuals with misophonia had lower pure tone thresholds at each frequency tested, except for 16,000 Hz. The overall pure tone average for the misophonia group ($N = 14$) was 9.07 dB HL in the right ear, 7.79 dB HL in the left ear, and 8.43 dB HL combined. The pure tone average for the control group ($N = 3$) was 9.67 dB HL in the right ear, 13.33 dB HL in the left ear, and 11.5 dB HL combined. In the high frequencies, the misophonia

group’s thresholds were below 1 dB HL and mainly in the negative range barring 16,000 Hz (see Figure 1.1). However, it is crucial to observe that at 16,000 Hz, the median was 0 dB HL, and the mode was -10 dB HL.

LDL Tone (Hz)	Control Group Mean (dB HL)	Misophonia Group Mean (dB HL)
500	105	95.54
1,000	106.66	92.68
2,000	97.5	90.18
4,000	92.5	85.89

Figure 1.2: Mean loudness discomfort level for right and left ears combined in people with and without misophonia

It was also observed that the misophonia group displayed elevated loudness discomfort levels (LDL), especially at 4,000 Hz. The misophonia group had a mean of 85.89 dB HL LDL for both ears, while the control group had a mean of 92.5 dB (see Figure 1.2). Additionally, the misophonia group had an LDL average of 85 dB HL in the right ear and 86.78 dB HL in the left ear. The median was 85 dB HL as well. The typical range for loudness discomfort levels in normal hearing individuals is 86 to 98 dB HL.⁶⁴ This places the misophonia group just below the average LDL for 4,000 Hz.

Discussion

⁶⁴ Knobel, K. A., & Sanchez, T. G. (2006). Loudness discomfort level in normal hearing individuals. *Pró-Fono Revista De Atualização Científica*, 18(1), 31–40. <https://doi.org/10.1590/s0104-56872006000100005>

This study aimed to define an audiological profile for people with misophonia and identify potential audiological underpinnings of misophonia. The study hypothesized that the audiological profile would reflect above-average pure tone thresholds in the higher frequencies, such as 14,000 Hz to 20,000 Hz. The findings of this study support this hypothesis with the average misophonia group's pure tone thresholds for 14,000 Hz at -1.25 dB HL, 18,000 Hz at -1.61 dB HL, and 20,000 Hz at -6.25 dB HL (see Figure 1.1). Based on the average pure tone thresholds of the misophonia group, the audiological profile of a person with misophonia consists of 12 dB HL or lower thresholds and increasingly improves with each frequency.

These findings suggest that increased hearing sensitivity at high frequencies potentially causes misophonia. This could be related to the higher range of frequencies in which some trigger sounds exist. For example, a common misophonic trigger is chewing. One study found that chewing crispy foods generated high-frequency sounds of 5,000 Hz and above.⁶⁵ Since people with misophonia can hear better at higher frequencies, they may be able to hear certain noises that normal-hearing individuals cannot hear. These irritating sounds may exist in a range of frequencies that only people with “superhero” hearing can detect, which could be why people without misophonia do not find trigger sounds aggravating. Moreover, people

⁶⁵ Dacremont, C. (1995). Spectral composition of eating sounds generated by crispy, crunchy and Crackly Foods. *Journal of Texture Studies*, 26(1), 27–43. <https://doi.org/10.1111/j.1745-4603.1995.tb00782.x>

with misophonia may hear these sounds more intensely, causing a strong adverse emotional reaction.

Their improved hearing acuity, combined with their likely neurological differences, poses a strong case for the etiology of misophonia. The trigger noise's sound waves hit the individual's ear, and the sound makes its way to the cochlea, where the hair cells can detect and encode the higher-level frequencies ordinary hearing people cannot interpret. The cochlea sends off the encoded signal to the eighth cranial nerve to be processed by the brain. With the proposed auditory processing deficits by Schröder et al. (2014) and increased limbic, auditory, and autonomic connections by Jastreboff & Jastreboff (2014), the brain then processes and reacts to the auditory information abnormally.

Additionally, the study's results suggest a general heightened sensitivity to loud sounds at 4,000 Hz and above in the misophonia group (see Figure 1.2). The elevated loudness discomfort level at 4,000 Hz supports the concept of heightened sensitivity to noises in the higher frequencies. The elevated LDL could result from misophonia and the group's ability to hear better at a higher frequency. However, it is essential to note that about 35.7% of the misophonia group also reported hyperacusis symptoms, which could affect this statistic.

While this study proposes several hypotheses supported by preliminary data about misophonia, it is vital to recognize the limitations of the findings. This study had a sample of seventeen,

with fourteen participants in the misophonia group and three in the control group. This sample size falls short of the number of participants required for this study to be considered statistically significant. More control subjects are also necessary to compare the experimental and control groups accurately. Additionally, this study's population comprises undergraduate college students with ages ranging from eighteen to twenty-two. The population pool limits the ability to generalize the data to all age ranges. Future studies that include a larger group of participants with diverse ages are necessary to ensure the validity of this preliminary data.

This study found substantial preliminary data supporting the hypothesis that individuals with misophonia have “superhero” hearing abilities in high frequencies. The audiological profile created proves that people with misophonia can hear at lower decibels than the average person and that their hearing improves at higher frequencies, except for 16,000 Hz (see Figure 1.1). These findings pose the question if individuals with misophonia can detect or more intensely hear certain sounds at high frequencies that the average person cannot hear. Despite the limitations of this study, the future implications of the data found are significant to the field of audiology. Previously, there was a lack of research focused on studying potential etiologies of misophonia from an audiological lens. Future studies can build upon the findings in this study to further verify the data and make generalizations about the underpinnings of misophonia. Additionally, this research can be combined with

other neurologically based misophonia studies to determine the mechanisms that underlie misophonia.

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An Artist's Voice, A Healthcare Hand: Using Artwork to Open Medical Dialogue in Native Communities and the “All of Us” Project

Emily Miller

University of Oklahoma Norman Campus Land

Acknowledgement

Long before the University of Oklahoma was established, the land on which the University now resides was the traditional home of the “Hasinai” Caddo Nation and “Kirikir?i:s” Wichita & Affiliated Tribes. We acknowledge this territory once also served as a hunting ground, trade exchange point, and migration route for the Apache, Comanche, Kiowa and Osage nations. Today, 39 tribal nations dwell in the state of Oklahoma as a result of settler and colonial policies that were designed to assimilate Native people. The University of Oklahoma recognizes the historical connection our university has with its indigenous community. We acknowledge, honor and respect the diverse Indigenous peoples connected to this land. We fully recognize, support and advocate for the sovereign rights of all of Oklahoma’s 39 tribal nations. This acknowledgement is aligned with our

university's core value of creating a diverse and inclusive community. It is an institutional responsibility to recognize and acknowledge the people, culture and history that make up our entire OU Community

Introduction

In the mid- to late-1900s, the business of uranium mining was booming; following World War II, the demand for this medical, industrial, and defense-supporting element was at an all-time high. In mines across the United States, uranium extraction pumped water toxins, radioactive dust, and radon gas into the environment. Nowhere were the uranium mines more prevalent than in the Southwestern United States, an area that is demographically dense with Native American communities, where large deposits of the desired mineral were relatively common. Although it has many uses, the profit of uranium came at a deadly cost to the populations near the mining regions.

As uranium mining demand slowed, the effects of this industry boom were just beginning to be felt by the communities around it. The radioactivity produced by the mines had a major impact on the health and wellbeing of the Native American communities near them. These communities included the Hopi, Southern Cheyenne, Arapaho, and others, but the most drastically affected were members of the Navajo Nation in the Western United States. Researchers were becoming aware of higher rates of lung and bone cancer, as well as fibrosis and kidney disease

among the communities near the radioactivity⁶⁶. Scientists and healthcare providers alike were alarmed, and quickly sought to work with the communities to explain the risks they had developed and encourage people to be proactive with their future healthcare. Specifically, they sought to communicate with members of the Navajo (Dine') Nation, living on the reservation land near these mines in New Mexico and Arizona.

Graphs, data analysis and reports that by scientific community standards were magnificent were paraded one by one across a screen for Navajo leaders and citizens alike. They sought to explain *epigenetics*, in which an environmental factor affects the way the genetic material within our bodies functions. As these presentations came to an end, however, the problem became clear -- Navajo citizens were unable to understand the complex and convoluted ways in which scientists were presenting their information⁶⁷. In addition, other Native communities were completely unable to discuss cancer and disease, as these topics are cursed or taboo within their communities. The scientists were facing a major dilemma. How were they to warn and assist these communities with concepts they either would not or could not discuss?

Though conversations surrounding the negative health effects these communities may face have been had since the 2010s, only recently did the true implications of scientists' conversations with Native communities come to light. These

⁶⁶Moore-Nall, Anita. "The Legacy of Uranium Development on or Near Indian Reservations and Health Implications Rekindling Public Awareness." *Geosciences*, vol. 5, no. 1, Feb. 2015, pp. 15–29. *Crossref*.

⁶⁷Quetawki, Mallery. Interview. Conducted by Emily Miller, 15 September 2022.

discussions of epigenetic changes made it clear that there were gaps in the scientific world's understanding of Indigenous genetics. Though the effort to fully map the human genome, the Human Genome Project, had been completed in 2003, less than 4% of data used in genomic study was from subjects of Latin, African, or Indigenous American descent⁶⁸. In an effort to remedy this misrepresentation of human populations, the Precision Medicine Initiative was announced by the Obama Administration in 2015. In order to properly understand genetic medicine, a full picture of all demographic groups is necessary, and this project has committed to at least 50% of new genomic data collected being from minority groups⁶⁹.

Scientific communication with Native communities is more needed than ever on the heels of the Precision Medicine Initiative, otherwise called the “All of Us” project. Researchers across the country are seeking to fill the holes left in the overwhelmingly white data of the original Human Genome Project. In Native American populations, however, the prospect of genetic testing and medicine holds a history of trauma and exploitation that can never be fully understood.

In order for the “All of Us” program to truly include all people, there is much to understand about Native American communities and the history of mistreatment they have suffered at the hands of genetic researchers. From misuse of genetic data to outright discrimination in the form of educational

⁶⁸ Guglielmi, George. *Facing up to injustice in genomic science*. Nature. Vol 268. Pp 290-293. 2019.

⁶⁹ Fox, Keolu. “The Illusion of Inclusion — The “All of Us” Research Program and Indigenous Peoples’ DNA” July 2020_N Engl J Med 2020; 383:411-413

inequity and consenting processes, Western medicine has consistently labeled Native communities as “other,” and treated them as such. This article seeks to provide an overarching view of this historical mistreatment and recognize present and future efforts to make genetic research more culturally respectful of Native communities.

Genetic Research Through the Lens of Decolonization

Before exploring genomic data specifically, the historical oppression and colonization of Indigenous communities must first be noted. Genomic freedom touches on the concept referred to by many academics as “decolonization,” a process which is often casually mentioned as a social justice buzzword with no reference to Indigenous hardships⁷⁰. In their article, “Decolonization Is Not a Metaphor,” Eve Tuck and K. Wayne Yang posit that though decolonization is a critical aspect of social justice, it is often a term used in incorrect contexts. Decolonization in this context refers to the repatriation of Indigenous land, and the righting of historical wrongs such as the startling level of poverty in Indigenous communities. Tuck and Yang argue that decolonization cannot be lumped in with all other social justice movements, as it is itself an entire movement. Thus, decolonization can be broken down into many parts, from land sovereignty to educational reform, and I argue that freedom to

⁷⁰ Tuck, Eve & Yang, K.. (2012). *Decolonization Is Not a Metaphor*. Decolonization. 1. 10.25058/20112742.n38.04.

decide how or if to interact with genetic testing is also a form of decolonization. As explained later on in this article, genomic medicine and research holds a long history of oppression for Indigenous communities, and Native people must be released from colonial practices and be able to regain control over their health and the research done to improve it. Tuck and Yang explain that genetic material has become a “trade product” of modern day colonialism; DNA samples have taken the place of fur and crops as the items that white “settlers,” in this context researchers, continue to take without regard for the communities from which they are being taken.

Though there has been much discourse on the appropriate terminology to use when discussing Indigenous groups in the United States, the general consensus is that the terms “Indigenous” and “Native American” are interchangeable. Thus, I will be using these terms interchangeably throughout this article.

In addition to proper terminology, it must also be noted that all Native communities within the United States, though they may share similarities, are unique and distinct communities with their own belief and practice systems. I would like to note that as such, it is often inappropriate for non-members of these communities to discuss spiritual and cultural beliefs, such as taboos and specific practices. Each mention of these beliefs when referring to a specific tribe or nation will be intentionally approached in a non-specific way in order to remain culturally respectful.

As a member of the Choctaw Nation myself, the issues of tribal belonging, sovereignty and cultural respect are immensely personal. Due to historically being championed as a “civilized” community by white governmental agencies, the Choctaw Nation may be slightly more involved in and accepting of genetic genealogy research than other communities mentioned in this article. The interplay of white government leaders and Indigenous government policy is an issue for another time, but the mistreatment of Native individuals and communities affects all tribal groups. This article is a culmination of my own interests in genetics and improving diversity in genetic medicine, and I now invite you to take a journey with me back to 1989.

Cautionary Tales - The Past

To understand the hesitancy with which Native communities approach genetic testing, it is worthwhile to consider a specific scenario of exploitation. The Havasupai lawsuit provides an example of this mistreatment, and a brief overview will provide the needed context for further discussion.

In 1989, members of the Havasupai tribe, a small group in Arizona, sought to understand if their members had a genetic predisposition to diabetes. They approached researchers at Arizona State University, and around one hundred members were quickly included in a genetic study. This study included broad consent to “study the causes of

behavioral/medical disorders⁷¹.” *Informed consent* is a key aspect of human subject research which informs participants of exactly what is being studied and any risks or benefits the study may provide. The consent in this research study was overly broad, but of the members signing it, only a few had even completed high school and many spoke English as a second language. Because researchers were so eager to use Havasupai genetic data, proper consenting techniques, such as the necessity for consent documents to be understood by all parties and written at a proper education level, fell by the wayside. This disconnect in consenting would become the main argument for the tribe’s defense in their lawsuit.

Although the diabetes research they had requested was completed, the genetic data had also been used to study other topics unbeknownst to the Havasupai participants. The data was used to study migration, mental disorders and even inbreeding -- topics which are all considered taboo in Havasupai culture. It was not until 2003 that a member of the tribe realized her data had been used without her proper consent. She had consented to what she believed was diabetes-specific research, but found out nearly fifteen years later when reading that this had not been the case. Although the published information was scientifically sound, because it violated informed consent, it could not be considered reliable data. Consent is a founding principle of proper research ethics, thus, unethical

⁷¹Sterling, Robyn L., “Genetic Research Among the Havasupai: A Cautionary Tale.” *Virtual Mentor*. 2011;13(2):113-117

research includes that in which research participants have not been properly consented.

Now comes the real question -- was it truly a violation of informed consent? The answer, to me, is a resounding yes. The participants who signed the consent were not properly informed of what would be done with their data, and thus all else is for naught. Some researchers, including authorities of the Institutional Review Board may argue that broad consent was acceptable, but the truth of the matter is it was not. The Havasupai members were not given the respect of having the entire study explained to them in a way that was cognizant of their education levels and backgrounds. Researchers believed that they could use the genetic data as they wished because the participants had been consented to such a broad range of research⁷². This speaks volumes to the general stereotype that Native American populations are poorly educated, as their lack of understanding in the consent documents was brushed aside as common and acceptable. This lack of understanding is through no fault of their own, however, as historically the United States has provided very little to Native community education. From the early days of colonialism, Native communities have been left to fend for themselves economically and politically, leaving many communities impoverished and struggling to have enough to eat, much less formalized education that prepares Indigenous students for the Western world. The lack of proper scientific education in particular

⁷²Garrison, Nanibaa' A. "Genomic Justice for Native Americans: Impact of the Havasupai Case on Genetic Research." *Science, technology & human values* vol. 38,2 (2013): 201-223.

has proven to be key in the conversation regarding Indigenous communities and genetic research.

In 2004, the tribe filed a lawsuit against Arizona State University for misusing their data and improperly consenting the participants of the study. It would take nearly six years for the court to reach a settlement of monetary compensation; the most important part of the settlement was the agreement to return the blood samples taken twenty years prior to the Havasupai tribe for proper spiritual release from the living world. This was a key aspect of the impact the case had on future studies with Native American communities.

Prior to the Havasupai case, it was mostly understood that genetic samples were the “property” of the lab that took and used them. However, Native beliefs often include the belief that all parts of the body hold the spirit and soul, including any blood, hair, saliva, et cetera that may have been collected for testing. Thus, these samples must be properly released from life in religious ceremonies the same way a tribal member’s body must be. By allowing these samples to return to the Havasupai, some peace was restored to their troubled minds. Though beliefs of the Havasupai tribe cannot be generalized to other Native communities, many Indigenous groups in the United States hold similar beliefs regarding the body and soul.

The Havasupai case is just one example of the mistreatment experienced by Native communities at the hand of genetic researchers. This case is indicative of the structural oppression of Native communities built by invasion and

colonialism and this oppression's effect on all interactions with Indigenous communities -- even scientific research. While this specific case explores the issue of informed consent, another key aspect of Native hesitancy to participate in genetic research is outlined in author Kim TallBear's book *Native American DNA: Tribal Belongings and the False Promise of Genetic Science*. Through specific discussion on the concept of race and racial discrimination in America, TallBear brings to light the important social and political ramifications that certain DNA discoveries may have. TallBear explains that studies of migration and heredity can be used to fan the flames under "scientific racism," a term that describes the misuse of scientific discovery to support racist ideologies⁷³. It is understandable that groups traditionally viewed as outsiders, destined to "die out" or be assimilated into white, Western culture would be hesitant to provide their DNA. In order to facilitate the proper use of Native DNA, there must be a two-way understanding among Native participants and Western researchers.

The scientific dialogue between Native groups and Western researchers must be facilitated in a way that is culturally respectful, specifically regarding taboos such as the mention of cancer and other diseases. Thus, Native participants must be the ones to bring the topics to light after prompting, rather than scientists directing the conversation. These dialogues are crucial to including all people

⁷³ TallBear, Kimberly. "RACIAL SCIENCE, BLOOD, AND DNA." *Native American DNA: Tribal Belonging and the False Promise of Genetic Science*, University of Minnesota Press, 2013, pp. 31–66. JSTOR.

in the future of genetic research and medicine. So how do researchers hope to open the door to these conversations? The answer, it seems, may lie not in the laboratory, but on an artist's canvas.

An Artist's Voice - The Present

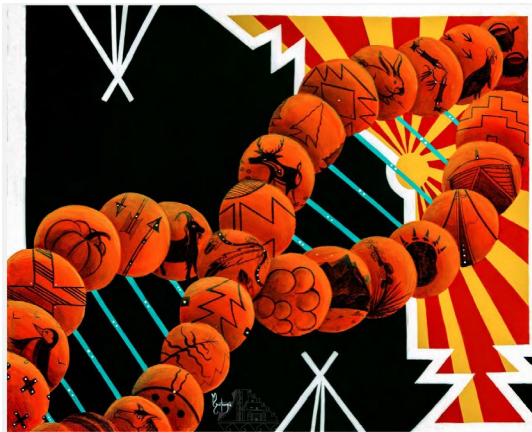
With such a history of mistreatment and exploitation, Native communities are often hesitant to speak with researchers, much less participate in research. How can there be productive conversations when colonialist power imbalances have left Native American communities without the necessary tools to engage in scientific discourse?

Enter Mallery Quetawki, a Zuni Pueblo artist whose artwork is bridging the gap between scientific research and Native American communities. Quetawki uses Native imagery to open a dialogue between Native communities and Western-style researchers. In her work, Native protectors such as the eagle or the war pony join forces with images of the immune system to explain how the system works in our bodies to protect us from disease. A beaded necklace represents our strands of genetic information and the uniqueness each person holds. In this image, Navajo and Cheyenne River Sioux clan symbols are used to show the way DNA connects us to our ancestors⁷⁴. Quetawki also explains that “the white tipi structures and the triangular peaks around the rays represent the idea of home and belonging.” This image uses the common Native phrase “all my relations” to show how all people are connected,

⁷⁴“DNA -- All My Relations.” Mallery Quetawki.

both by blood and by genetic material. Regardless of what is being represented, Quetawki's artwork makes scientific information more accessible for communities that have traditionally been underserved by the scientific and medical worlds.

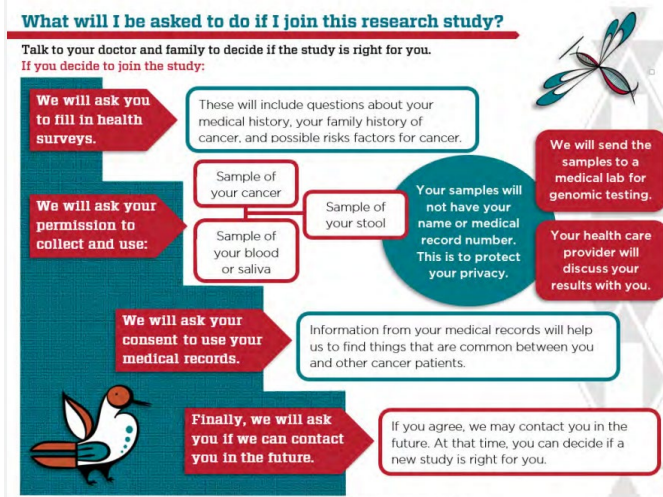
Quetawki's work brings to a new light the ways in which scientific communication can differ from the traditional data presentation form. Though the data from her presentations of artwork is not quantifiable in the traditional sense, many tribal



members and leaders have expressed their appreciation for the artwork -- specifically, the way it opens the door for Native communities to be involved in scientific conversations.

As seen through the COVID-19 Pandemic, scientific literacy across the United States is often severely lacking. In the case of Native American populations, this is not a failing of Indigenous communities; rather, governmental oversights have left Native education programs underfunded and understaffed, leading to a subpar scientific

education for Native children. Quetawki's artwork has been used to make science more relatable; one of the most important ways was emphasizing the need for group gatherings to be suspended during the height of the pandemic. For Native communities, gathering is often a spiritual practice rather than just social, and the inability to gather left many feeling isolated, depressed and lonely. Quetawki's artwork framed COVID-19 in a new



light, allowing Native communities to understand that they were not allowed to gather for their own safety. This ability to reframe scientific concepts to be more easily relatable is key to opening the way for genomic research with Native communities.

In the era of the “All of Us” project, these scientific conversations are more important than ever. Quetawki has created infographics such as the one on page eleven relating to genomic sequencing and DNA repair, which compare each person’s

genome to a beaded necklace. Culturally recognizable artwork also adorns the infographic⁷⁵. *Genome* refers to all of the genetic material within a person that holds their trait variations. Beadwork in Native cultures can represent a wide range of concepts, from cultural ties to spiritual beliefs⁷⁶. By explaining that each person's genome is similar to a unique beadwork pattern and further explaining the benefits and risks of participating in a genomic research study, Quetawki's work bridges some of the gap between the Western scientific community and Native communities.

Quetawki also explains how DNA can be repaired, much like a beaded necklace, as seen in the image below. While the focus of the image is the "beadwork," the flowers in the bottom corner and the pattern reminiscent of a blanket in the top corner are patterns from Crow beadwork^{77, 78}.



⁷⁵ *Genomic Sequencing Infographic*. Mallery Quetawki.

⁷⁶ Gray, Malinda. *Beads: Symbols of Indigenous Cultural Resilience and Value*. University of Toronto. 2017

⁷⁷ Quetawki, Mallery. Interview. Conducted by Emily Miller, 15 September 2022. (n3)

⁷⁸ *DNA Repair*. Mallery Quetawki.

Quetawki explains that through comparing DNA repair to beadwork or stitching, the process may be more easily understood by the Native communities to which the work is presented. In addition, significant images such as the dragonfly, which represents one's connection to their ancestors, on the infographic further explain the genetic concept of heredity without any words necessary.

Quetawki's artwork is just one way in which conversations about genomic medicine are being opened with Native communities. These conversations are crucial for Western medicine and Native health alike; data from the All of Us project may be used to understand hereditary cancers and other diseases, or to develop new drugs and treatments.

While a piece of artwork can in no way remedy the years of medical abuse and trauma surrounding Native American research subjects, the opportunity to make science more relatable cannot be overlooked. In addition, Quetawki's work as a member of an Indigenous community allows the gap between Western medicine and Native culture to be bridged. Through approaching Native communities with the intent to educate in a way that is culturally respectful, rather than condescending, Western medicine may have much more success including Native subjects in their research. Quetawki's art brings Native culture to the forefront of the scientific conversation, rather than it being an afterthought. This approach allows the humanity and culture of Native subjects to be respected --

something that has often been lacking in Western scientific research⁷⁹.

Quetawki's work is a step in the right direction for creating scientific education and research that is culturally competent and respectful. However, there are many ways in which scientific conversations with Native communities can be even more collaborative in order to properly include indigenous people in research. This collaboration requires awareness of and respect for Native culture from all people, not just researchers. From finding reputable sources online to respectfully speaking with Native community members, the opportunities for education are endless.

Though the breadth of information may seem daunting, guidance from members of Native communities themselves may be helpful in helping to increase the public's understanding of Native culture and beliefs.

A Healthcare Hand - The Future

Though it should not even need to be stated that respecting another's culture is necessary, I once again must stress how critical it is that scientific conversations with Native communities become more culturally respectful. There are multiple benefits that the scientific community as a whole may reap from increasing communication and research with Native American communities, but none of the benefits will ever come to light without the efforts of both scientist and non-scientist to

⁷⁹ Roche VF. The Sustained, Positive Impact of a Native American Cultures and Health Course on Students' Education and Practice-Related Choices. *Am J Pharm Educ.* 2014 Nov 15;78(9):172.

understand the wide range of Native cultures and their histories marked with oppression and mistreatment.

Through viewing Native communities as their own sovereign cultures, the scientific community can lean into collaboration, rather than simple data collection. Working with Native communities in a way that respects their cultural and spiritual beliefs will allow for greater trust to be gained and greater progress to be made.

As presented by discussion groups and panels among Native and non-Native scientists in meetings from 1995 to 1999, one of the major ways in which communication may be further improved is the way in which researchers frame their questions when asking for consent to involve Native populations. Native communities may not see nor understand the urgency or importance of certain research questions in the same way geneticists do⁸⁰. Tailoring research to truly benefit Native communities, rather than using their data for broad, all-encompassing “human” research, is a crucial step that must be taken, even in the “All of Us” project. As seen in the Havasupai case, tribal members were willing to participate in research that *directly benefited them* (diabetes research), but not to have their genomic data used for the general public.

However, the results of the “All of Us” project may be used for nationwide drug development and genetic understanding. This must

⁸⁰Burhansstipanov, Linda, et al. “NATIVE AMERICAN RECOMMENDATIONS FOR GENETIC RESEARCH TO BE CULTURALLY RESPECTFUL.” *Jurimetrics*, vol. 42, no. 2, 2002, pp. 149–57. JSTOR.

be properly communicated and Native communities must be properly consented to this widespread use. Researchers must be aware of language and education barriers that exist among many Native communities. Consent documents must be written at the proper level, which is often equivalent to a middle school education at most due to the failure of the US government to properly educate Native students⁸¹. As seen in a study from the Stanford Center for Biomedical Ethics, situations like the Havasupai case have not truly changed the way most researchers view research with indigenous communities. Nanibaa' Garrison states, "If researchers and [Institutional Review Boards] do not change their practices in light of [the Havasupai case], [Native populations] will likely continue to be excluded from a majority of research studies and left with less access to resources and potential benefit from genetic research participation."⁸² By refusing to change the way the consenting process is done with different cultural communities, scientists are actually doing a detriment to a much larger range of people than just one community.

Ways in which to improve both professional and personal relationships between Indigenous research participants and researchers have been outlined by multiple collaborative boards of both Native and non-Native scientists, researchers, tribal elders, and community members. Some of the most prominent suggestions for how to improve the

⁸¹Quetawki, Mallory. "Artist's Statement: DNA." *Academic Medicine* January 2020. vol 95, no 1, pp. 69

⁸²Garrison, Nanibaa' A. "Genomic Justice for Native Americans: Impact of the Havasupai Case on Genetic Research." *Science, technology & human values* vol. 38,2 (2013): 201-223. (n5)

working relationships between researchers and Indigenous participants speak to the necessity of Native and non-Native education alike. Native communities must receive quality education that prepares students to interact with Western medicine, but at the same time, Western researchers must be properly educated in culturally respectful procedures and ways of approaching research. Tribal leaders and keepers of knowledge must be included in the research design and consenting process in order to ensure that no cultural taboos are being violated. Finally, young Native scientists and students must be mentored, encouraged and guided in a way that allows them to be successful in both Indigenous and Western ways of knowing.

Though the “All of Us” project will have a multitude of positive effects for the general United States public, Native communities may not be able to benefit from them given their current socio-economic states following hundreds of years of oppression. One key consideration, is the fact that the drug development in the wake of the project may lead to new pharmaceuticals being made that are far out of financial reach of Native communities -- even when their data was used to help create the drugs.⁸³ This is caused by the continued prevalent disregard for Native communities and their health. Though this may be a topic for an entirely separate paper, it must be noted when considering the future of genetic research with Native communities.

⁸³Fox, Keolu. “The Illusion of Inclusion — The “All of Us” Research Program and Indigenous Peoples’ DNA” July 2020_N Engl J Med 2020; 383:411-413 (n3)

As a hopeful future Choctaw researcher and medical professional, I cannot begin to explain how much different my university experience would have been without the support of Indigenous student communities on campus. Specifically, the science and math organization, which helped me find the very research path I now write about. Organizations and mentorship such as this will allow Native students to see themselves as the professionals of tomorrow, encouraging them to include their culture and communities in their academic futures. Programs on university campuses such as the Genomics and Ethics for Native Students (GEN) program at the University of Oklahoma allow Native students the opportunity to be directly involved in the growing landscape of genomic research.

One may wonder, how can *I, a nonscientist*, be helpful in increasing scientific literacy among Native communities? The answer is simple; increase your own cultural and scientific literacy in order to combat the ignorance that others may present. Reading this article is but one step towards understanding the roadblocks standing in the way of truly inclusive genetic research. The future of genetic research with Native communities lies in empathy, cultural awareness and respect for all people. Only then will the “All of Us” project truly be a successful, cross-cultural genetic representation of the people it seeks to serve.

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Mallery Quetawki, for her enthusiasm and trailblazing into the field of genetic communication with Indigenous communities.

Susan Miller, for instilling my love of learning and love of others from an early age, being my biggest cheerleader, and never missing an accidental comma splice.

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Images (reproduced with permission)

DNA -- All My Relations. Mallery Quetawki.

DNA Repair. Mallery Quetawki.

Genomic Sequencing Infographic. Mallery
Quetawki.

Folk Music as Praxis: How Pariyerum Perumal Sung an Anti-Caste Message to Kollywood

Saadia Nazir

One of the central themes found in South Asian cinema is arguably caste. Whether overtly displayed or not, caste lurks in the shadows of every movie. These displays can be harmful stereotypes, but there are some recent cases in which caste is portrayed with an unflinching gaze meant to reflect the reality of lower caste individuals and the discrimination they face. In the South Indian state of Tamil Nadu, the local cinema industry has revealed influential directors who are determined to highlight the diversity of the Dalit experiences. Dalit means “broken but resilient” and are usually those of lower oppressed castes, but it is important to note that it is an anti-caste term.⁸⁴ The word Dalit continues to reflect caste, but it is an active reclamation of identity beyond an oppressive system that makes access to education, housing, and basic human rights difficult for those of lower and out castes. The Dalit identifier allows for the issues presented by caste to be named and recognized such that the structural and social inequalities created by it can be dismantled.

There are many schools of anti-caste thought, but the scope of this paper focuses primarily on Ambedkarite and more unmarked

⁸⁴ Equality Labs 2018, 10.

experiential perspectives. As a prominent figure in Indian history, Bhimrao Ramji Ambedkar held many positions in the nascent Indian government but is also known for his critical theory and action on the dismantlement of caste. Iconic depictions of Ambedkar include his blue three-piece suit, the color of which has come to be symbolic of the Dalit movement.⁸⁵

The usage of Ambedkar's likeness and politics can be seen throughout many films in the subcontinent, including in the growing anti-caste film movement in the Tamil Kollywood industry. The 2010's were a critical turning point for Kollywood where Dalit creators, like Mari Selvaraj, "began making films that secured popular support beyond rigid identitarianism [...] while also garnering critical acclaim."⁸⁶ These anti-caste, realist films become grounds for discourse in a manner that is both easily digestible and still radical in message for Tamil audiences. *Pariyerum Perumal* (2018) adopts a pedagogic approach to music and dialogue that leads audiences to the central politics of anti-caste theory in the movie. While conscious Ambedkarite ideology can be a powerful motif when utilized in cinema, there is an argument for the organic experiences which lead the individual to self-realization and the radicalization against caste. There is a radical humanistic message that can be heard in the village folk music, felt in the village environment, and seen in the interactions of Dalit life on the silver screen. The current

⁸⁵ Venkataraman 2017, 28.

⁸⁶ Valan 2022, 175.

cinematic sub-culture of Kollywood is an example of a new social movement led by directors, like Mari Selvaraj, who are determined to push Dalit voices into the mainstream using folk music or Dalit arts. This cinematic “mass” revolution can be seen through the success and intentionality of the movie *Pariyerum Perumal*; the soundtrack of which celebrates Dalit folk artists, dancers, and instruments. Such a message that centers on the pervasive nature of caste-based violence subverts typical media plots which enable an upper-caste hegemony in media. Instead, Mari Selvaraj utilizes songs which have always been vehicles for mass messaging in Kollywood to drive the emotive message and aesthetic of self-love and freedom in his film. A comparative analysis of the two songs *Vanakkam Vanakkamunga* and *Engum Pugazh Thuvanga* demonstrates how folk music acts as a medium of storytelling and cathartic release for Dalit performers. The songs in the movie create a narrative in which the titular lead, Pariyan, encounters a personal crisis as he is violently targeted for his caste. In between the celebration of Dalit village life in [*Vanakkam Vanakkamunga*](#) and the dignified folk performance of [*Engum Pugazh Thuvanga*](#) the audience witnesses’ Pariyan’s emotional path to self-actualization and realization as a Dalit individual.

Caste politics touch the lives of many individuals in the subcontinent and beyond. The instances of caste discrimination experienced by Dalits will never fully be understood by me, a Muslim member of the Indian diaspora with class

privilege. I do, however, understand discrimination and the multi-faceted nature of identity in South Asia. Thus, I use my own experiences to further understand the Dalit movement and connect the struggles of my community with it. It is important to critically examine anti-caste politics presented by Dalits so that a cohesive movement can take place for furthering social equality. As such, the people and locality which shape the movie *Pariyerum Perumal* warrant contextualization.

The history of lower caste musicians in Kollywood is no new phenomenon, and some of the most iconic and celebrated artists come from this marginalized community. For example, Ilaiyaraaja has scored many notable movies and composed soundtracks for songs that have come to represent a Tamil pop culture identity. Born into a Christian Paraiyar family, his music composition reflects his heritage and cannot entirely be divorced from his music.⁸⁷ Ilaiyaraaja, nicknamed “Isaignani” meaning musical genius, is responsible for a major revitalization and shift in Tamil film songs that took place in the 1970s and 1980s.⁸⁸ His exposure to Western music, particularly harmony, in the Tamil Protestant Church and from training with Master Dhanraj, an influential Western classical instrumentalist and composer in Madras (now Chennai), can be heard in the unique hybrid arrangements that moved away from only classical Karnatak structures which dominated soundtracks.⁸⁹ The “syncretic [...] global popular music styles and

⁸⁷ Rajamani 2020.

⁸⁸ Getter 2014, 64.

⁸⁹ Kolappan 2019.

a wide range of folk music sounds” form the backbone of Ilaiyaraaja’s music and create an instantly recognizable sound.⁹⁰ This sound disrupted preconceived notions of classical upper-caste-dominated music and ushered in a new era of music in Kollywood from what came before. The altered sonic environment of Kollywood made space for musicians who did not hail from upper-caste, Brahmin backgrounds or chose to deviate from the mainstay classical raga structures of the industry. While Ilaiyaraaja brought folk artists onto Kollywood tracks, they have not been a part of the dominant caste culture nor given due respect. As a result, many audience members remain ignorant to the sound, symbolism, and intricacies of Tamil folk music despite it being in the background of many famous songs composed by individuals like Ilaiyaraaja. The way Selvaraj utilizes music in *Pariyerum Perumal*, however, does not allow it to fade into the background. Rather, music is presented as part of the medium through which the themes of Dalit liberation in the movie can be understood. In *Pariyerum Perumal*, the folk music is presented *without* cinematic pressure to be filmi or highly processed. While there are folk elements in the songs composed by Ilaiyaraaja, they are camouflaged by more global sounds which shifts the focus. The songs of this film, however, are proudly folk and presented in a raw, unfiltered manner. This reversal of filmi expectations firmly focuses on the folk sound which is of cultural

⁹⁰ Getter 2014, 64.

significance to the identity of lower and outcaste communities who perform, preserve, and enjoy it.

The movie follows the titular character Pariyan, short for Pariyerum Perumal, as he leaves his native village for law school and his varied experiences between the two locations—a setting which ironically runs parallel to Dr. Ambedkar’s life. The movie’s setting toggles between the mid-size city of Tirunelveli and Pariyan’s *ooru* (village) of Puliyankulam in the Thoothikudi district. In movies of a similar genre that feature a character’s college journey, *Pariyerum Perumal* does not portray the village as inferior or backward to the city. Both the city and the village are shown as multidimensional spaces where caste prejudice cannot be escaped. Despite the potential for caste violence to take place in both settings, Selvaraj utilizes the lush landscapes of the village and its surrounding nature to create a more relaxed atmosphere. It is in the village where Pariyan exists at ease among members of his family and community. While harassment can still happen in the village, it is not to the same degree as the humiliation he faces at college. In fact, acts of aggression in the village come from an external instigator. That is, when upper-caste individuals harass Pariyan in the village they maintain their caste privilege, but are aware they remain outnumbered in the Dalit part of the village. Thus, there is a communal power to the village/colony setting which affirms Pariyan’s Dalit identity.

In her novel *Karukku*, notable Tamil Dalit writer Bama described her own village in terms of a

cruel beauty. Bama penned an uncompromising testimony of the way caste shaped her identity—both in terms of internal and external perception. The way Pariyan’s village is represented in the film reflects Bama’s own complicated, yet tender sentiments towards her own *ooru* of Puthupatti. Bama recounts nicknames for individuals, mountains, flora, and fauna with an intimate knowledge that readers can only hope to understand fully.⁹¹ There is a sense of pride for the traditions woven into her village’s social fabric and form the foundations of her identity. While Bama recounts the mundane joys of her childhood, she reminds readers that caste violence affected her too from an early age. Even before she reached third grade, Bama “had already seen, felt, experienced and been humiliated” by others because of her social status as a Dalit girl.⁹² Selvaraj crafts Pariyan’s village with similar caste dynamics.

The movie opens with Pariyan and other villagers hunting, the setting is idyllic until the brutal mutilation and death of Pariyan’s dog, Karuppi. It is important to note that the perpetrators who stole Karuppi were all landowners of a higher caste. These same individuals commented that Pariyan and his friends had no right to hunt on their land and used Karuppi as a means for retaliation. Selvaraj pans immediately over to Pariyan’s humiliated group lamenting about their limited options to stand up for themselves. Viewers hear the back-and-forth discussion: “Do you want us to face

⁹¹ Bama 2012, 1-9.

⁹² Bama 2012, 11.

police action?” “Only we will face it, is it?” “They have everything.”⁹³ Pariyan intimately understands, and is reminded, that until “(their) father(s) stop working in their (upper caste) fields” they will continue be subjugated because they are denied social, economic, and relational agency because of their caste.⁹⁴ Pariyan is encouraged by his village elders to do something more than till the same fields his forefathers did. Law is presented as the path to justice. Becoming a lawyer—like Dr. Ambedkar—will be Pariyan’s ultimate salvation.

Education is discussed as a radical equalizer from which ample opportunities spring forth by authors like Bama. Bama, however, asserts that this is only a false promise that is limited by casteist ideologies upheld by the institutions themselves.⁹⁵ Those who are in positions of power in academic settings sometimes benefit from an institutionalized, casteist system that afforded them access whereas people like Bama and Pariyan are denied their own potential. The English medium Government Law College campus in Tirunelveli is no exception to this and soon becomes a place of torment for Pariyan. It would be amiss to not mention the epidemic of caste-based hate crimes in schools across India. The story of Rohit Vemula is one of frustration and desperation. Vemula, a Ph.D. student at the University of Hyderabad, committed suicide in 2016 after being suspended from the university. The reason? Suspicion. Vemula was denied his stipend and suspended from his program because of

⁹³ Selvaraj 2018, 6:19–6:57.

⁹⁴ Selvaraj 2018, 6:57.

⁹⁵ Bama 2012, 23.

his association with the Ambedkar Student Association.⁹⁶ In a heartbreaking letter, Vemula cites the “fatal accident” of his birth, and it is understood that the caste identity he was prescribed was his undoing.⁹⁷ Vemula was not afforded dignity nor fairness and it can only be assumed that his lack of agency drove him to suicide. Many in the Dalit community, however, view Vemula’s final moments as a moving testimony to his martyrdom and as a last grab for agency. It is only more painful when one sees that there are many more who suffer like Rohit Vemula, some whose names never even make the news.

Lower caste individuals like Pariyan, Bama, and Rohit Vemula are stereotyped as stupid, lazy, or dangerous. These negative impressions are not limited to the individual but are also used to portray Dalit and folk culture in a negative light. Dalit and folk cultures are multidimensional and deserve as much praise as any other. The mainstream puts classical music, Karnatak and Hindustani, on a pedestal and continually fails to recognize the merit and vibrancy of folk music. Folk music, however, cannot be treated as a monolith nor dismissed as lacking meaning and worth to those who use and produce it. For example, the folk music of Assam is different from that of Tamil Nadu, and so on. In Tamil Nadu, folk music utilizes instruments like the *thavil* (a barrel shaped, two-sided membranophone), the *parai* (a frame drum made of buffalo hide), the *urumi* (a two-sided tension drum), and the

⁹⁶ “My Birth Is My Fatal Accident: Rohith Vemula’s Searing Letter Is an Indictment of Social Prejudices” 2017.

⁹⁷ “My Birth [...]” 2017.

nadaswaram (a double reed aerophone). In *Pariyerum Perumal*, all these distinct instruments can be heard at the forefront of every song. Selvaraj worked with Santhosh Narayanan, a prominent music director from an upper-caste background, on the soundtrack of the movie. Narayanan is considered by many as a “celebrity ally” because of his association with Dalit creatives, but this label can prove problematic unless properly navigated.⁹⁸ Like the concept of a white savior, there is the trope of an upper-caste savior that is pervasive in Indian media. Selvaraj avoids this and intentionally empowers Pariyan in scenes with folk music as seen in *Vanakkam Vanakkamunga* and *Engum Pugazh Thuvanga*. These folk songs in the movie provide an affective experience for the audience to understand the pride Pariyan feels for his community that pushes him to move forward and underscore the power of a self-assured identity.

In *Vanakkam Vanakkamunga*, viewers are welcomed to Pariyan’s colony with a celebratory song that shows him at his most comfortable and in his element. Before the song begins, Pariyan formally meets Jo, an upper-caste girl who encourages him to find textbooks in Tamil and to take his tests in the language which he is most comfortable (in his English medium Law College). This moment would typically be spun in a filmi context to set up a romance between the two characters, but Selvaraj shows Pariyan is most excited about his own learning compared to meeting Jo. The movie transitions from a soft piano score to

⁹⁸ Vaashi 2021.

a shot of the *thavil* drum and a call to listen and learn about the people for whom Pariyan strives for excellence.

Ayya vanakkam vanakkamunga
Welcome, welcome (Ayya denotes respect)
Paasamulla sabaiyora
Esteemed guests
Vanakkam vanakkamunga
Welcome welcome
Paasamulla sabaiyora
Esteemed guests
Koodum periyora
Our dear elders
Gunamulla thaaimaara
Our uncomplaining mothers (Selvaraj 2018,
25:00-25:10).

https://www.youtube.com/watch?v=Gc_Dy-dD96s (0:10-:25)

The pounding sound of the *thavil* is the only instrument heard in the song and even though the song was recorded in a studio, it feels as if Selvaraj has taken documentary footage of what might be seen in a village. Elders and young children alike are gathered casually around the *thavil*, played by Ganapathi, which outlines simple *adi* (cyclical rhythm) that the two folk singers Puliyanakulam Velmayil and Puliyanakulam Kannan sing over. The grounded atmosphere of the song is enhanced by the ad-libs narrated in the song. Occasionally, an “Aama!” punctuated by shouts are heard in the background which only adds to the feeling

Vanakkam Vanakkamunga was recorded on-site rather than in a studio.

The song is grounded in its description of the people and the place of Puliyanikulam. In fact, rarely does one hear the actual singers referenced in a film song but the line “Pakkam pattu Sekar Jegan Vijaya Kannanunga” references Kannan who recorded the song.⁹⁹ The locale is described to listeners as Velmayil and Kannan narrate their village with their strained voices nearly shouting. The excited voices of the singers do not deal much with scales or vocal modulation that is found in classical music as they sing in a simple and deep manner. The relaxed feel of the song invites anyone irrespective of musical knowledge, and with the circular entrancing rhythm of the *thavil* it draws the audience in to dance along. It is important to note that everyone on screen is dancing along to this song. The link between dance and song, especially in folk music, highlights the “interconnected, intersensorial nature of music structure and embodied practice”.¹⁰⁰ In *Vanakkam Vanakkamunga* images of villagers dancing freely in the village contrast visual cuts to Pariyan in Tirunelveli where the usual bustle of a city surrounds him. There is a freeness to the lyrics and the moves of the villagers which reflects Pariyan’s comfort as he dances among them. In the accompanying visuals, Pariyan is more than just a student or a loafer in the village. He partakes in communal work with the same vigor as his studies

⁹⁹ Selvaraj 2018, 26:32.

¹⁰⁰ Sherinian 2022, 9.

in tending to fields, harvesting bananas, and cutting the hair of young boys. Through village life, there is added depth to Pariyan as it shapes his actions, the way he speaks, and moves through the world. The song comes with a tongue-in-cheek disclaimer that if this truly represents village life it will also come with the anger of it.

Aadugindra aadalilum

In the dance we do

Paadugindra paadalilum

In the dance we do

Sollil kovam koodi irukkalam

In the words we say there may be some anger

Sollil kovam koodi irukkalam

In the words we say there may be some anger

Nalla nanbana pola

Like a good friend

Neenga kettu kolla venumunga

We want you to put up with it (Selvaraj 2018,
27:15-27:30).

https://www.youtube.com/watch?v=Gc_Dy-dD96s
(2:26-2:45)

Life in the village is not easy, nor does it become any easier for those who leave for the city in search of more opportunities. It is only fair if there is anger shown alongside their joy lest the villagers become reduced to smiling caricatures devoid of realism. If their displeasures are not voiced and heard, then the binding value of community that supports them in grim times cannot be fully understood.

The value of community is again highlighted in *Engum Pugazh Thuvanga*, except Pariyan is now the spectator watching as his own father performs in a village celebration. Pariyan's community uplifts him, but at this point in the movie, he lies at a crossroads. At this moment, the audience sees his turmoil to reconcile negative perceptions of him and his caste with his own love for his family, people, and traditions. Before the song sequence, Pariyan is thrown into the ladies' bathroom and locked inside. What ensues is one of the most painful scenes as Pariyan experiences a PTSD episode based on the time Jo's family locked him in a room and beat him nearly to death. Pariyan writhes and cowers on the floor of the ladies' bathroom and is humiliated in front of his peers by Jo's cousins again. When freed, he is notified that he must bring his father to the campus, and he concedes. Importantly, the previous time his father was summoned to campus, he paid another man to pretend to be his father and lied that he worked as a bull cart driver. Up to this point in the movie, the audience does not know who Pariyan's father really is, nor what he does for a living. His father is a folk performer who cross-dresses and does not fit into normative ideals of fatherhood. Pariyan, in a moment of clarity, however, realizes that he cannot shy away from the reality of who his family is. Though Pariyan might want to protect his father, he has lived through the pain his own son is experiencing. Thus, Pariyan realizes that no one will understand his situation better than those of his own community and, they

will continue to be his source of strength for they have lived the struggles he endures.

Pariyan finds his father at a village dance celebration as one of the main cross-dressing Karagam performers. The song begins with an *oppari*-style lament with its melodic contour falling below the tonic reflecting Pariyan's emotional and sullen state. The signature vocal climb of a raspy folk singer rings out, followed by an exclamation that goads on the performance. In contrast to the Karnatak style of singing that emphasizes virtuosity, there is an unadorned rawness to folk music. This raw raspy timbre present in folk music colors the flayed wounds described in the song borne by Pariyan. The introduction of the reedy *nadaswaram* accompanies this lament which is contrasted by scenes of Pariyan and his entire family. All these scenes of Pariyan with his parents are coded as joyful familial memories. Then suddenly, the tone of the song shifts. One of the singers makes a sound by kissing his teeth followed by the *thavil*'s entrance of a cycle of 12 quick beats called *temangu* accompanied by the deep hum of the rubbed head of the *urumi* tension drum. This upbeat drum entrance signals that there is still hope and joy present in folk music and Dalit culture.

Incredibly, the singers shown are well-known folk artists Anthony Daasan and Mariappan who appear as themselves in the movie. Even Pariyan's father is played by folk performer Thangasaru. Rather than using the performers in the background and showing a more "cinema friendly" version with actors replacing the folk artists,

Selvaraj once more centers folk art *and artists* allowing them to speak for themselves. The song's production is cohesively folk and framed as if it was recorded at a village festival. The only thing missing is the whistling and the rowdiness of the crowd which surrounds Pariyan. In turn, Selvaraj and Narayanan have isolated the performance and despite a fragmented recording process in a faraway studio created a cohesive and holistic sound.¹⁰¹ The sound along with the visuals highlight the creativity of the performers and allow the narrative lyrics to shine once again. The lyrics are presented in a classic folk call-and-response style by the two singers with each transition marked by a rhythmic cadential shift where the *urumi* and *thavil* play three consecutive phrases before returning to the 12-pulse temangu rhythm. These celebratory patterns are firmly Tamil Dalit-Bahujan in sound and identity, creating an earthy feel which grounds the high emotional stakes of the movie.

Pallikoodam padikka vandhai
You came to school to study
Pavusaaga kooda irundhai
You even looked cool
Pattam peraamalae
Before you could graduate
Gnaana thangamae
My precious wise one
Padhiyila parandhuttiyae
You flew away midway
Rathinamae kannamaa

¹⁰¹ Getter 2014, 63.

My gem, my dear one (Selvaraj 2018, 1:48:42-1:48:59).

<https://www.youtube.com/watch?v=BOtUHbAiLz8>
(1:14-1:37)

The song seems to parallel Pariyan's journey thus far in the film, and in between cuts from Pariyan's father performing we see a touched Pariyan who tries to regain his composure. The difficulties Pariyan—and other lower and out-caste students—face when seeking higher education are difficult to reconcile. Upper-caste society colludes to prevent disenfranchised individuals from gaining agency through education such that they may challenge the status quo. By preventing people like Pariyan from progressing, the social power of the upper caste is protected. Pariyan can recognize this and fears what would happen to his father and him on the campus, but he also believes in the power of their identity as Dalit-Bahujans. We see in this affective scene the tumultuous inner conflict Pariyan undergoes contrasted with his father's freedom of expression in the village dance circle. It can be assumed that most of the people watching and cheering on Pariyan's father are of lower castes, and this circle is a safe space for Pariyan and his father to exist as their full Dalit selves. As the song climbs to its rhythmic climax, Daasan exclaims "Puliyankulam Selvaraasiya kokkaa!," a powerful closing statement that Puliyankulam Selvaraja (Pariyan's father) is less than no one.¹⁰² After this closing statement and the crowd disperses, viewers

¹⁰² Selvaraj 2018, 1:51:42.

see that Pariyan's tears have dried, and he stands tall. His father's performance and the song have reminded him of the power his own identity provides that comes from internal and communal validation. With his father, he goes to see the principal and is again reminded that he should never shy away from who he—or his father—is. It is at this point in the movie that we see Pariyan come to realize that he has the power to fight back, and it is those who recognize and share his struggle who will empower him.

In conclusion, the path to self-actualization comes first from communal validation. Selvaraj demonstrates this in his movie *Pariyerum Perumal* primarily through the medium of music and dance. Art is political in this movie, and Selvaraj taps into the pain and oppression of Dalit people transforming it into an affective sonic and visual message. Selvaraj firmly rejects the hegemony of upper caste dominated Kollywood media and centers the experiences of his lead character (Pariyan) such that audiences are not force-fed an anti-caste message. Rather, audiences witness the horrors Pariyan undergoes and must naturally come to their own conclusions. Does the audience dismiss the actions of Jo's family and reduce them to isolated actions, or do they recognize it as a structural form of oppression upheld by institutions and enacted by casteist bullies? The story arc of Pariyan is not demoralizing without hope. In fact, the movie traces his realistic experiences in the pursuit of education and self-betterment which lead to his radicalization against the caste-violence

wrought upon him. Pariyan is humanized throughout the movie and the tenderness seen in the communal celebration of earlier scenes, such as in *Vanakkam Vanakkamunga*, never leaves him. It is impressive that Selvaraj does not let Pariyan become an overly hardened and desensitized individual. Instead, he is empowered by his community for whom he fights and strives for a better future. The two songs *Vanakkam Vanakkamunga* and *Engum Pugazh Thuvanga* may seem different in their moods, the first being joyous and the latter somber or lamenting, but they show the same story from two different perspectives. Ultimately, both songs represent the multidimensional nature of Dalit stories and experiences—to claim one is more thematically representative than the other is reductionist. The two combined, however, allow for a dynamic portrayal of Pariyan's journey to empowerment and fight for agency as an empowered Dalit. It is then up to audiences to determine what this touching and highly affective movie will empower them to do—to stand up against caste injustice wherever it may be or to choose a path of ignorance having seen the hardships Pariyan faced.

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Are You Hurting More Than Helping? An Analysis of Problematic Allyship in Glee

Grace Chesley

In liberationist movements throughout history, out-group allies are considered an integral part of the success of each respective movement (e.g., The abolitionist movement, the suffragette movement, the Civil Rights movement). While allies can be effective in helping movements gain political traction, ill-conceived allyship works to the detriment of minority groups and their political interests. This research will dissect how problematic allies harm queer people and queer liberation while enjoying the status of ‘ally’ and a sense of moral superiority. I will present research over harmful allyship while using the Fox Network show *Glee* as a touchstone to demonstrate how well-intentioned individuals can perpetuate homophobia and transphobia. This paper will define problematic allyship and what it looks like, what kind of damage it does, as well as determine when allyship becomes problematic. Using *Glee* as a jumping off point, this research will show that allyship becomes problematic when it reinforces negative ideas and stereotypes about the LGBTQ+ community to combat more overt homophobia or otherwise help queer people. By examining how problematic allyship is unintentionally perpetuated by a mega-

popular show like *Glee*, this paper will provide insight into how and why inequality is maintained by well-intentioned allies.

The hit Fox Network show *Glee* is a satirical comedy that uses the plight of high school students to explore various social issues. The show centers around an Ohio high school's competitive show choir, the titular Glee Club, and how its various underdog members cope with their low position on the school's social ladder. The club is purportedly only made up of minority community members, many of which are queer, and a large portion of the show is dedicated to examining homophobia in a small-town setting. Because of the notable queer representation and campy vibes of the show, it has been continually loved by the LGBTQ+ community since its inception. I have chosen to use *Glee* to anchor my argument, not only because it is a well-loved show in the queer community, but because it continues to receive lots of media praise for its "well done" representation of queer people and queer issues. While the sheer amount of queer representation in *Glee* might seem beneficial to the LGBTQ+ community, I will argue that it is the quality of the representation that counts. It is important to note that the show is satirical, however the instances that I will mention do not critique the shows satirical elements but instead examine the ways that the show falls short of the queer representation it was trying to achieve.

First, problematic allyship must be defined. In a research project done by the Society for the Study of Social Problems, researchers looked at how

allyship is constructed and how it can be problematic. The researchers interviewed 70 college students who claimed to be an ally to one or more minority groups and analyzed the ways that their allyship ultimately reinforced patterns of inequality. They posed two broad ways the allyship of the students was problematic—by blaming the minorities for the inequality they faced, or by suggesting individual methods for fighting inequalities rather than structural.¹⁰³ Therefore, using the definition of the aforementioned study, this paper will examine problematic allyship as allyship that ultimately reproduces systems of inequality, either through assigning blame for inequalities to the affected minority groups, or by suggesting individual remedies for change instead of structural change to unequal systems.

A common way inequality is reproduced in *Glee* is through the suggestion of individual methods to combat homophobia, not structural. For example, in season two episode eight, one of the shows gay characters, Kurt, is being bullied for being gay by a student named Dave, who is very traditionally masculine presenting. Kurt knows that Dave is closeted and scared of how open Kurt is about being gay, which only makes the bullying more intense and violent. Eventually, the bullying is brought to the school board, who only issue a verbal warning to Dave for threatening to kill Kurt. The principal steps down to “personally protect” Kurt, and lots of people express their sympathy to him, but the

¹⁰³ J E Sumerau et al., “Constructing Allyship and the Persistence of Inequality” (Oxford University Press, 2020) 358.

school administration does nothing else.¹⁰⁴ This is a perfect example of allies suggesting individual remedies for homophobia rather than structural. The school does not change the way they deal with harassment or homophobia, instead they treat the problem as a one-off incident between two students. The school board suggests an individual remedy for homophobia through their verbal warning to Dave, and the principal suggests an individual remedy by offering to personally protect Kurt. Neither of these acts of “allyship” do anything to address homophobia overall or even the problem of the queer person impacted, but both measures taken by the school’s administration are seen as advocacy for Kurt and other queer students. By not taking large measures against homophobia, the school places responsibility on Kurt, and the administration is “able to (1) maintain their assertion that combatting inequalities was ultimately the responsibility of members of marginalized groups, and (2) define themselves as good, moral people who supported better conditions for minorities.”¹⁰⁵ By only presenting individual solutions to the structural issue of homophobia in the school, the administration is placing the burden of change back on Kurt, while still preserving their reputation as good educators and ultimately “moral” people. This example from *Glee* demonstrates how allies unknowingly perpetuate homophobic systems by being unwilling to address these systems in their

¹⁰⁴ “Furt.” *Glee*, created by Ryan Murphy, season 2, episode 8, The Fox Broadcasting Company, 2010.

¹⁰⁵ Sumerau et al., 366.

entirety, while still empathizing with the affected queer person and maintaining their status as allies.

Generally, allies consider themselves exceptions to larger societal patterns of inequality, using a “moral identity” to define themselves as going against systems of oppression, when they are unknowingly reinforcing these systems.¹⁰⁶

Oftentimes, allies see fighting for the LGBTQ+ community not as a way to dismantle oppression, but as a litmus test for their own morality. The “moral identity” problem can be seen all throughout society, and because popular media holds a mirror to society, it can be seen all throughout *Glee*. For example, a previously homeschooled conservative Christian student named Joe finds himself in the Glee Club, surrounded by queer students and couples. He is asked to do a Valentine’s Day singing telegram from one lesbian club member to her girlfriend, and the whole episode focuses on his moral panic over whether to sing the telegram because the sin it represents goes against how he was raised.¹⁰⁷ By using his upbringing as an excuse to be homophobic, he exemplifies a common pitfall of allyship—claiming innocence. Claiming innocence (“I’m not homophobic” or “That’s the way she was raised” or “I didn’t mean it that way”) ignores the structural impacts of oppression and minimizes the social experience of the queer person.¹⁰⁸ Throughout the episode, Joe is concerned

¹⁰⁶ Sumerau et al., 367.

¹⁰⁷ “Heart.” *Glee*, created by Ryan Murphy, season 3, episode 13, The Fox Broadcasting Company, 2012.

¹⁰⁸ Grace Pollock, “Affective Allyship: Alt-Ac Identity and Political Work in Higher Education” (University Press of Kansas, 2022) 53.

with himself and his reputation, not the experience of the lesbian students.

Later in this episode, he consults the school's "God Squad," a Christian club with other Glee Club members in it, and they tell him that he should go through with it because the girls are his friends. In the end, he goes through with the telegram and is celebrated for doing so.¹⁰⁹ In this episode, Joe only supports the lesbian relationship because of social pressure from his heterosexual peers. Joe's predominant social motivation for allyship is the avoidance of fear and shame from his peers because "the evaluation of one's humanity is directly related to one's capacity for proper political practice."¹¹⁰ By doing what the other God Squad members tell him, he is preserving his reputation as a non-homophobe and a good person—reaffirming his moral identity.¹¹¹ He does not sing the telegram because he believes that the two lesbian students deserve his support, but only because it would be a social faux pas to not sing it. Therefore, he perpetuates the first pitfall of allyship by blaming his homophobia on his upbringing, and only goes through with supporting the lesbian relationship to save himself from social scrutiny.

Another common pitfall of allyship present in *Glee* is assuming that all oppression is the same—as in denial or overidentification with someone else's oppression. Overidentification is uniquely harmful, as "allyship calls on allies to de-center themselves

¹⁰⁹ "Heart" The Fox Broadcasting Company, 2012.

¹¹⁰ Matthew Chin and Río Rodríguez, "On 'Gaymousness' and 'Calling Out': Affect, Violence, and Humanity in Queer of Colour Politics" (University of Toronto Press, 2018) 101.

¹¹¹ Sumerau et al., 366.

from the narrative.”¹¹² Throughout the show, there is a running theme that all the students are oppressed because they are in the Glee Club. In fact, the show choir director, in response to a claim that he was ignoring the needs of minority students, states “you’re all minorities, you’re in the glee club.”¹¹³ In reality, several students are not members of any minority group (they are white, cisgendered, heterosexual, Christian, etc.). By overidentifying the social struggle of being in Glee Club with actual structural oppression, the show is completely decentering the narratives of the people it claims to represent. Not only is it decentering minority students, but by equating an unfavorable high school reputation with being a minority, the show completely delegitimizes the struggle of its queer characters while also claiming to understand that struggle. By claiming to all be minorities, the allies put themselves on the same level as the minority students, denying the existence of the structural oppression queer people face. Furthermore, the non-minority club members get to keep their titles as allies because they supposedly sympathize with their struggles of their queer friends, while also releasing themselves of any responsibility to fight for their queer friends because “they are all minorities” and are supposedly facing the same amount of discrimination. By assuming that all oppression is the same, the non-minority Glee Club members are both

¹¹² Pollock, 54.

¹¹³ “Throwdown.” *Glee*, created by Ryan Murphy, season 1, episode 7, The Fox Broadcasting Company, 2009.

overidentifying with and denying the struggles of their queer friends.

While analyzing *Glee* is a useful way to demonstrate what problematic allyship is and how it functions, other research must be used to examine how to change the problematic practices of real-world allies. In an exploratory study, a team of researchers did in-depth interviews with 20 college-aged queer people and asked them what expectations they have for straight allies. The expectations that came out of this study are varying, but the consensus is that queer people want engagement in political activism, affirming support, and personalized support from their straight allies.¹¹⁴ In fact, in a study focused on the health of LGBTQ+ youth as it related to their overall feeling of acceptance in their community, researchers showed support from peers has a significant impact on the health of queer people.¹¹⁵ Researchers found that the most frequently mentioned negative factor associated with a queer identity was feeling that it was necessary to hide that identity from teachers and community members in general. Youth overwhelmingly reported negative factors that indicated feelings of social isolation and internalized feelings related to their identity. On the positive side, youth said that friends were a major source of support, and that peers were the most likely group in their lives to provide support.¹¹⁶ These two studies effectively demonstrate the need

¹¹⁴ T D Forbes and K Ueno, "Post-gay, Political, and Pieced Together: Queer Expectations of Straight Allies" 174.

¹¹⁵ Darrel Higa et al., "Negative and Positive Factors Associated With the Well-Being of Lesbian, Gay, Bisexual, Transgender, Queer, and Questioning (LGBTQ) Youth" (2014).

¹¹⁶ Higa et al..

for supportive allies and delineate the best ways for allies to support their queer peers.

According to research, education is the best way to combat problematic allyship. In order to be an effective ally, people need to be informed of the common ways allies inappropriately advocate for the LGBTQ+ community. In a study done on the impact of “safe zone” or “ally” programs in American universities, researchers showed that the stickers alone had no effect on feelings of safety but showed that trainings can improve student safety and acceptance on campus.¹¹⁷ However, these trainings cannot improve the university’s climate without administrative help. In order to bring change to a campus and educate students on queer issues, the administration must make structural changes to combat homophobic and transphobic systems. Structural change to oppressive systems is the foundation of liberation, and universities have the power to revolutionize what it means to be an ally to the queer community. Therefore, ally trainings are necessary and should be expanded in universities to protect and uplift queer students.

Many successful social movements have relied on the help of allies to succeed, but the impact of allyship and what it means to be an effective ally to the queer community has not been sufficiently studied.¹¹⁸ This paper looks at how well-intentioned allyship can become problematic, citing examples from the hit show *Glee* to demonstrate how allies can unintentionally harm the queer community and

¹¹⁷ Stephanie Ballard et al., “Finding Queer Allies: The Impact of Ally Training and Safe Zone Stickers on Campus Climate” (2008).

¹¹⁸ Forbes and Ueno, 174.

reinforce systems of oppression. Overall, effective allyship comes from de-centering oneself, giving personal support to queer friends, and challenging systems of oppression.

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The Circle of Pomegranate: Finding Religious Syncretism Through Fruit

Lauren Gastineau

The pomegranate, a highly mystical and symbolic object for ancient cultures, while still prevalent today, is often overlooked by modern, Western literary analysis. The pomegranate is often a forgotten piece of archaeological evidence due to its poor preservation, however, when looking at a large range of materials and texts that portray the pomegranate, one can see there is an obvious importance in the use of the ruby fruit. The domesticated fruit was used in many different regions and in a variety of ways. There are a few differing opinions on how the Bronze Age trade routes affected the spread of pomegranates, which will be further explored in the first section of this paper. The use of pomegranates has been linked with symbolism that is shared across several different religious cultures. One reason for this syncretism could be explained through its trade and its imagery as a luxury fruit in some areas.

Looking at the spread of ancient empires and the trade routes of the Early Bronze Age, the movement of the pomegranate can be roughly traced through the centuries. The archaeological evidence of the pomegranate's spread also displays another interesting connection between religious cultures. Examining the context of the archaeological evidence, the pomegranate can be

connected to the symbols of life and death. Using a condensed history of the Bronze Age trade through the lens of the pomegranate, one can see that there is also a passing of symbolism associated with the pomegranate. Religious cultures of the Bronze Age including the Etruscans, Myceneans, Minoans, Mesopotamians, Assyrians, Early Israelites, Egyptians, and Greeks (later the Romans and early Christians as well) all use the pomegranate as a symbol of fertility and death. The use of the pomegranate as a symbol in each of these civilizations begs to question the religious syncretism taking place.

A focused history shows the path of the pomegranate as well as the spread of the symbolic message associated with the fruit. The pomegranate shows up over a wide geographical area and several historical periods making its adaptation between cultures a very interesting study. Due to the widespread geographical locations and wide-ranging time periods, scholars have sought to locate the origin of the fruit, but the pomegranate also appears to be associated with two major parts of the life cycle that are celebrated in these cultures: death and fertility. To further interpret the relationship between the apparently contradictory symbolic association of the fruit with life or death, this paper will explore these symbols and connect the use of the pomegranate to a bigger picture symbolic association and analysis of the lived religions of the Bronze Age. This paper will explore the pomegranate in several forms such as bioarcheology, ceramics, inscriptions and texts, art

and decorative motifs, and religious myths. Looking closely at the Bronze Age period between 3000-1200 BCE and some later examples, the pomegranate is a commodity that quickly spread as a symbol throughout the Near East, Mediterranean, North Africa, and the Aegean. Although many studies examine the pomegranate within each culture, there is little written about the pomegranate as a syncretic symbol between religious cultures. The paradox of life and death through the pomegranate, when looked at through the lens of several religious cultures from around the same period can be further analyzed as a symbol of the circle of life and rebirth.

Pomegranates Everywhere

Out of any fruit, why should the pomegranate be explored in detail? Although the pomegranate is just one of many fruits that has religious cultural symbolism, the archaeological record for the pomegranate shows a wider connection between cultures. The pomegranate is widely discussed in religious and archaeological circles for its influential spread and common use in religious settings. The pomegranate can be found in several early religious origins being used for extensive modes. In Early Judaism and Christianity, the pomegranate can be found in temple decor and on religious regalia such as priestly garments.¹¹⁹ In Scripture, the Temple of Solomon is described as having engraved columns that depicted a flourishing

¹¹⁹ Michael Naas, "Pomegranate Seeds and Scattered Ashes: From $n+1$ to the One + n ," In *Miracle and Machine: Jacques Derrida and the Two Sources of Religion, Science, and the Media* (New York City, NY: Fordham University Press, 2012), 227.

pomegranate plant.¹²⁰ The pomegranates appeared on Hebrew seals in the 8th century BCE and at a much later date shows up on the Jewish sheqel coin.¹²¹ There are additionally numerous Biblical scriptures that mention the pomegranate, including the use of the pomegranate as a proof of fertility of the land of Canaan in the book of Numbers.¹²² Furthermore, a decorative pomegranate scepter top was found in an antique shop in Jerusalem that dated to the Late Bronze Age with an inscription stating, “Sacred to the priests in the house of God.”¹²³ Although the inscription was later found to be a forgery the pomegranate scepter was verified as a real archaeological artifact from the Late Bronze Age.

The pomegranate shows up in several Egyptian tombs and graves and increasingly appears in archaeological record as Egyptian and Levantine civilizations control the Mediterranean trade. According to several scholars, Thutmose I first brought pomegranates to Egypt after military conquest in Syria.¹²⁴ The earliest sightings of pomegranates in Egypt to date consist of wall art and preserved fruit dating to fifteenth century BCE.¹²⁵ As the pomegranate spread to the

¹²⁰ Margreet L. Steiner, “In Search of... The Temple of Jerusalem.” *Inhabiting the Promised Land: Exploring the Complex Relationship between Archaeology and Ancient Israel as Depicted in the Bible*, ed. John D. Caputo (Oxford, UK: Oxbow Books, 2019), 158; 1 Kings 7:13, 18, 20, 40-42 (New International Version); 2 Kings 25:17 (NIV); 2 Chronicles 3:16 (NIV); 2 Chronicles 4:13 (NIV).

¹²¹ Nahman Avigad, “The Inscribed Pomegranate from the ‘House of the Lord’” *The Biblical Archaeologist* 53(3) (Chicago, IL: University of Chicago Press, 1990), 162.

¹²² Numbers 13:2, 23, 20:5 (NIV).

¹²³ Steiner, 173.

¹²⁴ Sara A. Immerwahr, “The Pomegranate Vase: Its Origins and Continuity.” *Hesperia: the journal of the American School of Classical Studies at Athens* 58(4) (Athens, Greece: The American School of Classical Studies at Athens, 1989), 405.

¹²⁵ David M. Whitchurch and C. Wilfred Griggs, “Artifacts, Icons, and Pomegranates: Brigham Young University Egypt Excavation Project,” *Journal of the American Research Center in Egypt* 46 (Garden City, Egypt: American Research Center in Egypt, 2010), 225.

Mediterranean and thus, Minoan, Mycenaean, and Greek culture the use of the fruit as a symbol is continually seen. In Greek religion, the pomegranate is found as a center for several myths and as decorative motifs. Archaeological excavations have uncovered statues of both the goddess Nike and Hera grasping pomegranates,¹²⁶ most likely as a symbol of fertility or a victory over death. During Hellenistic growth the pomegranate was also introduced as medicine.¹²⁷

Moreover, in Asian religious cultures, pomegranates have been commonly used as offerings to deceased relatives or gods. Although the majority of scholars view of the origin of the pomegranate to not be in Asia, the pomegranate in a similar symbolic meaning in different context suggests that not only was the material culture of foodstuffs being traded along Trans-Asian routes such as the Silk Road, but the use, symbols, and spiritual aspects of these cultures were being traded as well. Zoroastrian culture planted pomegranates in the courtyards of their fire temples and used the seeds, stems, and rinds in rites and customs.¹²⁸ In Buddhist myth, Siddhartha Gautama was gifted a pomegranate by a poor, old woman and adopted as one of the three blessed fruits.¹²⁹ The pomegranate transitioned from Semitic religious cultures to all over Asia. From Middle/Near East, North Africa,

¹²⁶ Whitchurch and Griggs, 228.

¹²⁷ Whitchurch and Griggs, 228.

¹²⁸ Cheryl Ward, "Pomegranates in Eastern Mediterranean Context during the Late Bronze Age," *World Archaeology* 34(3) (Milton Park, UK: Taylor & Francis, Ltd., 2003), 532.

¹²⁹ Barbara Koenen, "Muse," *Gastronomica* 11(2) (Oakland, CA: University of California Press, 2011), 49.

Mediterranean, and Asia the pomegranate and its use as a symbolic motif is evident.

The pomegranate spread through intense international trade and can be associated with a symbolic belief through the movements into civilizations. The pomegranate has been passed through trading routes used for commodities connected to the elite class, explored further in the following section. The pomegranate is typically found in high class gardens, temples, and tombs associating it categorically with luxury. The pomegranate has a natural aesthetic that is thought to be vibrant, plentiful, and very unique, which likely drew civilizations to use the fruit as a luxury or exotic good to be sold. Additionally, the nature of the pomegranate as a luxury and elite good led to its use as a symbolic object.

According to Corrie Bakels and Stefanie Jacomet, bioarchaeologists specializing in organic materials analysis, luxury foods are categorized as “foods that are not really necessary for survival,” or “‘rare’, ‘expensive’ or ‘exotic’”.¹³⁰ The researchers explore the relationship between the pomegranate’s origin to central Europe and the view of the pomegranate as a luxury fruit through the study of bioarcheological evidence from 180 post-Roman sites in central Europe.¹³¹ In the study, Pomegranates were categorized in the “only rarely found” group and were considered to be largely reliant on import because of the pomegranate’s

¹³⁰ Corrie Bakels and Stefanie Jacomet, “Access to Luxury Foods in Central Europe During the Roman Period: The Archaeobotanical Evidence.” *World Archaeology* 34(3) (Milton Park, UK: Taylor & Francis, Ltd., 2003), 543.

¹³¹ Pomegranates are not found or hardly found in any central European archaeological records dating to a pre-roman period. Bakels, 552.

inability to grow in the central European regions.¹³² There is a higher likelihood of pomegranates found in military sites because the fruit was considered to be Roman and a luxury import; thus, only Roman soldiers could attain the fruit. Pomegranate usage did not increase in the sites that were associated with later dates, suggesting that the pomegranate did not become a more common fruit, keeping with its categorization as a luxury fruit in the Roman European period.

The categorization of pomegranate as a luxury fruit is important because of its connection to elite societies as well as its use in rituals. The pomegranate even into the Roman Period was thought to be a luxury fruit, thus in the Bronze Age when the pomegranate was even less common, and the fruit was still in demand for ritual and artistic use one can surmise that the status of luxury has been a long-standing categorization. As will be demonstrated in the next section, the pomegranate shows up most commonly in the higher or ruling class gardens, temples, and graves. Ward additionally suggests that the expansion of the pomegranate through elite culture initiated the spread of the pomegranate meanings as a “status-enhancing” symbol,¹³³ making the use of the pomegranate in burial ritual and fertility rituals more commonplace due to the elite association the fruit held.

¹³² Bakels, 547. Each food product in this category was found at less than 10 of the 147 sites. Many of the sites that consisted of pomegranate bioarch evidence were sites that were dominated by roman military legions.

¹³³ Ward, 534.

Domestication, Labeling, and Trade of the Pomegranate

One of the earliest found evidence of the pomegranates in decorative and spiritual use was in the Elam kingdom where a vase with a pomegranate relief was found in Uruk.¹³⁴ Years later, in the early nineteenth century BCE Mesopotamia raft men on the Tigris used the rinds to preserve the skins of the raft.¹³⁵ Moreover, the fourteenth century BCE Uluburun (Turkey) shipwreck connects a Syrian ship headed to Ugarit with several luxury goods such as metals and pomegranates.¹³⁶ This shipwreck shows the importance of the pomegranate as a good in high demand due to the amount of bioarcheological remains. While this shipwreck shows an early trade route for the pomegranate, Near Eastern communities were already using the pomegranate and motif in burial settings. Whole pomegranate bioarcheological remains and decorative vases were found in Jericho tombs dating to the Middle Bronze Age around 1700 BCE.¹³⁷ Mesopotamian and Levantine civilizations illustrate the use of the pomegranate as a symbol early in the chronological timeline of domestication and trade. This early use of the pomegranate could have promoted other cultures to use the pomegranate in similar ways as the message was used to explain and sell the luxury fruit.

¹³⁴ Federica Spagnoli, "The Golden Pome: The Pomegranate from its Deepest Roots to Modern Culture," *ASOR Ancient Near East Today* VII(2) (Alexandria, VA: ASOR, 2019), para 2, <https://www.asor.org/onetoday/2019/02/Golden-Pome/>

¹³⁵ Ward, 531.

¹³⁶ Ward, 529.

¹³⁷ Immerwahr 402.

The pomegranate is found in archaeological evidence of Late Bronze Age decorative motifs which are very similar to other archaeological finds that are attributed to Philistine-type vessels.¹³⁸ The Philistines are historically associated with the lineage of the Sea Peoples who ventured from West Asia (Turkey), Aegean, and Mediterranean islands. The Philistine-style keroi found in Tell Halif point to the pomegranate's symbolic origin.¹³⁹ The Sea Peoples, such as the associated Philistines, possibly migrated with the pomegranate to Canaan and other areas just as they brought the kernos vessel to Israel from their sea travels.

Adding to the argument that Mediterranean civilizations could have been a large trade power for the pomegranate, archaeologists discovered a set of cuneiform texts in Ugarit that reference to the existence of the pomegranate tree.¹⁴⁰ The coastal Mediterranean was thriving around the Late Bronze Age and trading with other people for plants such as the pomegranate. The site of Ugarit also was discovered to have an artifact described as a tripod with "numerous little pomegranate fruit pendants dangling around its circular rim."¹⁴¹ The use of the pomegranate as a decorative motif around 1500-1200BCE suggests that the plant tree was already grown and producing the fruit desired. Additionally, by the ninth century BCE, the pomegranate had clearly spread around the Levant, as it is mentioned

¹³⁸ Oded Borowski, "The Pomegranate Bowl from Tell Halif," *Israel Exploration Journal* 45(2) (Jerusalem, Israel: Israel Exploration Society, 1995), 153

¹³⁹ Borowski, 153.

¹⁴⁰ Linda Farrar, "Gardens of Ancient Mesopotamia and the Near East," *Gardens and Gardeners of the Ancient World: History, Myth and Archaeology* (Oxford, UK: Oxbow Books, 2016), 44.

¹⁴¹ Farrar, "Gardens of Ancient Mesopotamia and the Near East," 47; Avigad, 162.

in an Assyrian text of Assurnasirpall II, who specifically mentions the plant being used in his new garden.¹⁴² In the text he claims to have used “seeds and plants that I had found in the countries through which I had marched,”¹⁴³ thus highlighting the movement of the pomegranate.

Around the fall of the Mesopotamian empire, in the Mediterranean, the Late Minoan worship of nature was already well established into the Minoan culture as can be seen by the variety of motifs which showcase the veneration of trees.¹⁴⁴ Although there is little known evidence of the actual pomegranate tree in Minoan gardens the society was a large Mediterranean trade power and shared many goods and cultural similarities with Mycenaean, Levantine, and Egyptian communities.¹⁴⁵ The very closely related Mycenaean culture, additionally, has archaeological evidence of the pomegranate dating back to a fourteenth century vase,¹⁴⁶ thus the close connection between the Minoan and Mycenaean people and the Minoan worship of nature could have made the symbol of the pomegranate in some form very easy to incorporate into another culture.

By the Archaic, Classical, and Hellenistic Periods the pomegranate began to appear in literature. Homer’s tales of Odysseus describe gardens of the archaic people of Greece such as the

¹⁴² Farrar, “Gardens of Ancient Mesopotamia and the Near East,” 50.

¹⁴³ Farrar, “Gardens of Ancient Mesopotamia and the Near East,” 50.

¹⁴⁴ Linda Farrar, “Gardens of the Greek Bronze Age: Minoan and Mycenaean Cultures.” *Gardens and Gardeners of the Ancient World: History, Myth and Archaeology* (Oxford, UK: Oxbow Books, 2016), 72.

¹⁴⁵ Farrar, “Gardens of the Greek Bronze Age: Minoan and Mycenaean Cultures,” 73; Immerwahr, 405.

¹⁴⁶ Immerwahr, 398.

garden of AlkinoOs whose orchards contained “pear trees and pomegranate trees and apple trees with their shining fruit.”¹⁴⁷ Thus, the pomegranate must have been introduced before the archaic people in the Minoan period. Furthermore, the Mycenaean people used reference to Demeter as a god of horticulture and crop fertility,¹⁴⁸ thus the story of Persephone and the consumption of the pomegranate must have been established in the time between the creation of Demeter and the appearance of the story of Persephone in the Archaic Period.

Around the same time as Archaic Greek rule, the Etruscans were still in power in Italy. Roman imperialism and Alexander the Great’s Hellenization had also yet to occur. However, in the Etruscan Tomb of the Bulls dated to 540 BCE a fresco depicting a row of pomegranate fruits was discovered.¹⁴⁹ Not only did the Etruscans already have a working knowledge of the pomegranate tree, but they also used the pomegranate as a burial motif. The scene next to the one of the pomegranates depicts a Greek mythological scene revealing knowledge of Troy and the warrior Achilles.¹⁵⁰ The pomegranate then must have been commonplace in both Etruscan and Greek culture because the pomegranate was associated with this scene of Achilles’ foreshadowed death. The use of Greek history within an Etruscan tomb first displays

¹⁴⁷ Linda Farrar, “Greek Gardens and Groves of the Archaic, Classical, and Hellenistic Periods,” *Gardens and Gardeners of the Ancient World: History, Myth and Archaeology* (Oxford, UK: Oxbow Books, 2016), 89.

¹⁴⁸ Farrar, “Greek Gardens and Groves of the Archaic, Classical, and Hellenistic Periods,” 93.

¹⁴⁹ Linda Farrar, “Etruscan Gardens,” *Gardens and Gardeners of the Ancient World: History, Myth and Archaeology* (Oxford, UK: Oxbow Books, 2016), 130.

¹⁵⁰ Farrar, “Etruscan Gardens,” 131.

the integrated storytelling, and secondly, the additional use of the pomegranate as a decorative motif alongside the story could suggest that the fruit's message was also integrated with the passing of the history.

According to Whitchurch and Griggs, during the Greco-Roman period, which began around 332 BCE when Persian rule ended, pomegranates spread to Egypt as the accessibility to the fruit extended past the Greco-Roman elite due to the power and accessibility in trade.¹⁵¹ However, an account of the eighteenth dynasty, or eighth century BCE, orchards by Tuthmosis I's gardener Ineni claims that there were five pomegranate trees in the king's garden.¹⁵² Additionally, some of Tuthmosis III's temple carvings depict botanical conquest of his crusade in the Levant; these carvings include a recognizable pomegranate.¹⁵³ The pomegranate was thus being used in the garden setting by the eighteenth dynasty hundreds of years before Whitchurch and Griggs suggests. Tuthmosis III's use of the pomegranate in the fresco depicting a parade of conquest shows the luxury or high status of the fruit, rather than its origin because according to Ineni's textual evidence the pomegranate was already being grown in orchards of the king.

By the age of the Roman Empire, which encompassed the majority rule of the Mediterranean and surrounding areas, the pomegranate had already arisen in archaeological evidence. However, the

¹⁵¹ Whitchurch and Griggs, 225.

¹⁵² Farrar, Linda, "Egyptian Gardens." *Gardens and Gardeners of the Ancient World: History, Myth and Archaeology* (Oxford, UK: Oxbow Books, 2016), 15.

¹⁵³ Farrar, "Egyptian Gardens," 15.

expansion of the Roman Empire aided the spread of the pomegranate as is seen through the introduction of the pomegranate to Eastern Europe by military legions.¹⁵⁴ To the Romans, the pomegranate is called the “Punic or Carthage apple due to its production in and around the ancient capital of Carthage.”¹⁵⁵ The pomegranate was obviously seen as a luxury item by this time as the military leaders were the ones allotted the produce, but the spread of the pomegranate could have also spread the message associated with the pomegranate from culture to culture, thus explaining why the fruit is used in similar ways through a wide variety of religious cultures.

According to Farrar, the pomegranate is native to Persia because the Achaemenid depicted the fruit relatively frequently in the empire's art, such as the pomegranate gold earrings at Pasargadae.¹⁵⁶ While Persia is most likely not an origin location, the use of the pomegranate as a motif for a luxury decorative item such as metal earrings does illustrate some importance in the culture. The use of the pomegranate is seen in earlier archaeological evidence, so the movement of the pomegranate to this area was established by the Achaemenid empire from the early context of the pomegranate by Mediterranean peoples to Persia. Other scholars speculate that the poor preservation of the pomegranate results in too little evidence of the exact origin, meaning the pomegranate could have originated in Persia and moved to

¹⁵⁴ Bakels, 547.

¹⁵⁵ Whitchurch and Griggs, 224.

¹⁵⁶ Farrar, “Gardens of Ancient Mesopotamia and the Near East,” 62-63.

Mesopotamia. Ward claims that the origins of the pomegranate can be found East of Mesopotamia where the wild pomegranate can still be found today.¹⁵⁷ Based on an accumulation of archaeological evidence, the earliest context of the pomegranate can most likely be connected to the regions of Turkey and south Caspian who had early contact with sea peoples. The Near and Middle East could have been introduced to the pomegranate through Mesopotamian rule or through Sea Peoples who are historically connected to the Philistines. Additionally, the trade connections between Near Eastern early settlements to Mediterranean peoples also helps connect Near Eastern communities to Egyptian communities through the Mediterranean. Mesopotamian rule also spread to North Africa giving the pomegranate another path to Egypt.

The immense trade routes and movements of Bronze Age civilizations and some later Empires aligns with the chronological dating of known pomegranate archaeological artifacts. The trade routes not only help decipher an origin of the fruit but also give a potential path for how the pomegranate's symbol and message could have been spread to varied parts of the Near East, Mediterranean, Aegean, and North Africa. The pomegranate, early in the archaeological evidence, is connected to two symbols of life and death. The trade routes of the Bronze Age also point to several locations in which the syncretism of the pomegranate symbolism is highlighted.

Pomegranate as Death

¹⁵⁷ Ward, 530; Whitchurch and Griggs, 224.

In an archaeological excavation of Israel's Tell Halif, a Samarian ware, shallow bowl with a pomegranate decoration in the center was found in the entryway of a tomb.¹⁵⁸ According to researcher Borowski "[the bowl's] provenance suggests that it was a funerary deposit and most likely a cult object."¹⁵⁹ Several other similar bowls depicting a saucer with a pomegranate containing a hole at the top have been found in sites from the Late Bronze Age (1600-1200 BCE) to eighth century BCE, including Tell 'Eitun, Gezer, Megiddo, Sa'sa, Tell el-Hammeh, and Rosh Zayit.¹⁶⁰ These comparisons are often found in the form of kernoi, or vessels with multiple holders for offerings.¹⁶¹ The use of the pomegranate as a decorative motif in a ritual offering holder immediately begs to question the symbolism of the pomegranate in correlation to death. The kernos bowls were most commonly used for liquid, such as wine or juice, libation ceremonies.¹⁶² The use of the pomegranate juice spilling into the bowl implies a metaphoric or transformative experience of the pomegranate being crushed to make the red pigment which is often associated with blood.

When a pomegranate is cut open and the seeds are mashed, the juice, in many ancient religious cultures, appears similar to blood. The Tell Halif bowl has been debated to be used as a pressure plate in order to produce the juice in ritual burial ceremonies as a symbol of blood, which

¹⁵⁸ Borowski, 150.

¹⁵⁹ Borowski, 150.

¹⁶⁰ Borowski, 152-153.

¹⁶¹ Borowski, 153.

¹⁶² Borowski, 154.

spilled out of the top of the clay pomegranate and into the bowl.¹⁶³ Additionally, in several myths the pomegranate is symbolic of violence or blood, such as the tale of Dionysus being ripped in half by Titans and spawning pomegranate plants through his blood.¹⁶⁴ In this scene not only is the pomegranate a result of death, but the natural juice of the fruit also symbolizes a physical consequence and proof of a violent death.

The fruit is used as an offering to the dead in several other cases, many in Egypt. The pomegranate is found within Egyptian burial rituals as Dr. C Wilfred Griggs and Dr. Whitchurch's archaeological excavations in a Fayum necropolis illustrate.¹⁶⁵ A discovered pomegranate tapestry that was wrapped around a young child could have been a symbol of premature death and, therefore, an unsettled wandering spirit. An early sighting of the pomegranate in Egypt is dated to the fifteenth century BCE; this pomegranate, preserved whole, was found in the tomb of Queen Hatshepsut's estate overseer, Djehuty.¹⁶⁶ The pomegranate is most often found in grave and burial sites suggesting a strong connection with death. The tomb of the well-known King Tutankhamen even contained several bowls in the shape of pomegranates.¹⁶⁷ In Egyptian tombs, offerings and items are often left for the dead to take with them in their travels to the afterlife. Immerwahr even claims, "[b]ecause of its blood-red juice and many seeds, [Egyptian]

¹⁶³ Borowski, 154.

¹⁶⁴ Whitchurch and Griggs, 227-228.

¹⁶⁵ Whitchurch and Griggs, 215.

¹⁶⁶ Whitchurch and Griggs, 225.

¹⁶⁷ Immerwahr, 401.

recognized its appropriateness as a funeral offering, and through their insistence upon an afterlife, they may have set their seal upon the pomegranate as a symbol of life in death.”¹⁶⁸ The offering of the pomegranate could be used as food for the dead, as well as a sign of an elite class of the dead. Also, during the eighteenth dynasty (Ramesside period), pomegranates were illustrated on Tuthmosis III’s Festival Hall walls, and “nineteen votive faience pomegranates have been discovered in the tomb of Amenhotep II.”¹⁶⁹ Not only have pomegranates been found in several early Egyptian tombs, but in a ritual festival hall as well. The pomegranate is obviously used at celebrations or rites of passage, such as the passing of the dead into an afterlife, as suggested by its decorative motif in a festival hall. Thus, one can infer that the use of pomegranates in elite class tombs was also a ritual offering or symbol of death.

Even as early as the fourteenth century BCE the pomegranate can be found in burial sites, as is seen by the Mycenaean pomegranate vases in an Agora tomb.¹⁷⁰ Additionally, Egyptian type glass pomegranate vases have been found in several Cyprus tombs at Enkomi and Kourion.¹⁷¹ The find suggests that the Egyptian style glass decorative motif were manufactured to sell as goods to other civilizations for tomb offerings.¹⁷² The glass pomegranates illustrate the connection between religious cultures using the same decorative offering

¹⁶⁸ Immerwahr, 405.

¹⁶⁹ Whitchurch and Griggs, 225.

¹⁷⁰ Immerwahr, 398.

¹⁷¹ Immerwahr 400

¹⁷² Immerwahr 400

of a pomegranate in the context of death. Other Greek tombs were often found with busts depicting the deceased as a monument. These gravestones were dispersed widely across North Africa, Mediterranean and southwest Aegean.¹⁷³ The grave makers are commonly connected to underworld deities with iconographic symbols of death. A particular funerary bust found in Epidamnus dating around the second half of the fourth century BCE illustrates a young woman holding a pomegranate in her left hand.¹⁷⁴ The bust was thought of as a landmark for the dead to connect with wandering spirits.¹⁷⁵

As stated above, the pomegranate is found in tombs and burial settings throughout the Near East and Mediterranean. The symbol of death can be connected to the pomegranate through ritual objects, offerings, and mythology. Unique characteristics of the pomegranate such as its color and juice make the fruit a prime target for symbolism of blood and violence. Moreover, the extensive use of pomegranates as funerary offerings and decorations imply the fruits metaphorical image as death. While the pomegranate was established as a Bronze Age burial offering and death motif, simultaneously a paradoxical association with the pomegranate emerged. Without life there would not be death, thus, the pomegranate came to represent both the importance of fertility as well as the destruction of life.

¹⁷³ Mary C. Sturgeon, "Greek Funerary Busts," *Archaeology* 28(4) (Boston, MA: Archaeological Institute of America, 1975), 231.

¹⁷⁴ Sturgeon, 231.

¹⁷⁵ Sturgeon, 232.

Pomegranate as Fertility

The pomegranate is often associated with death due to its opposing, or better yet complimentary, symbolism as a symbol of fertility, and thus, rebirth, which will be analyzed in later sections. The pomegranate is often connected to life; however, in several cases the symbolism of the pomegranate goes a step further into the ideals of crop fertility as well as human fertility. In the case of religious myths, the pomegranate is often used to depict the transition from death to life and life to death. Funerary bust found in Greece and surrounding areas, such as the one found in Epidamnus, are typically cut off at the waist suggesting that the lower half of the body is located in the ground.¹⁷⁶ Only female funerary busts are found before the Roman period,¹⁷⁷ suggesting the significance of the woman as a reproductive laborer. The concept of a female bust being placed halfway in the ground could symbolize a return to the womb, as the earth during agricultural periods was associated with the womb because the fertile earth produces crops.¹⁷⁸ This concept also correlates to the myth of Persephone being trapped in the underworld, after eating a pomegranate, as a symbol of the womb before being reborn into the world during spring.¹⁷⁹

In the myth of Adam and Eve's fall, scholar's debate whether the pomegranate is

¹⁷⁶ Sturgeon, 232.

¹⁷⁷ Sturgeon, 232.

¹⁷⁸ Shelly Tilton and Rebekah K Latour, "Erections and Erectile Wills: A Theory of Male Reproductive Labor" (presentation, American Academy of Religion Conference, Denver, Colorado, November 19, 2022).

¹⁷⁹ Rigoglioso, 16.

associated with the fruit of life that Adam and Eve are allowed to eat in the Garden of Eden. The pomegranate is thus associated with the fruit of life, or the sustainer of eternal life until the fruit of knowledge of good and evil is eaten. When the forbidden fruit is eaten, humans realize that death is also a part of life and, therefore, the pomegranate that was once the sustainer of life is now a reminder of the punishment of death.¹⁸⁰ Archaeological evidence such as a tapestry dated to the fourth or fifth century BCE depicts the Tree of Life as a pomegranate plant, which appears commonly in Assyrian iconography.¹⁸¹ Furthermore, after the significance of the pomegranate is alluded to, the punishment of trying the other forbidden fruit is inflicted upon Adam and Eve. The punishment for their sin becomes expulsion, shame, and death, thus further reinforcing the idea of the pomegranate as the symbol of the cycle of life and death.

Some scholars even suggest that the Fruit of the Tree of Knowledge of Good and Evil could be the pomegranate as it is never clearly mentioned as an apple as often suggested. The root word for pomegranate also comes from Latin root *pomum granatum* meaning “apple with many seeds.”¹⁸² By using the pomegranate as a fruit of the Tree of Knowledge of Good and Evil, the symbolism of fertility could be connected to the temptation of the fruit. The fruit is associated with beauty, specifically female charm, and the temptation of a woman’s body. In the period, a woman that is fertile

¹⁸⁰ Goor, 218.

¹⁸¹ Whitchurch and Griggs 228

¹⁸² Keonen, 48. Goor, 215.

is typically seen as a driving force for heterosexual male attraction, therefore, also connecting the beauty of the fruit to the nature of a woman's fertility. The pomegranate often gets associated with heterosexual coupling and attraction due to the biological ability of a woman's fertility. The use of the pomegranate according to Whitchurch and Griggs is still "thrown in a newlywed's path at traditional Cyprus weddings to assure plentiful posterity".¹⁸³ The pomegranate is a symbol of the heterosexual attraction and union in both the story of Adam and Eve and wedding ceremonies due to its symbol of fertility which is one historical factor for marriage.

Additionally, the pomegranate can further be connected to fertility, much like its connection with death, through the juice as a visualization of blood. Rigoglioso claims that "red appearing in nature has long been associated with menstrual blood."¹⁸⁴ Menstrual cycles were also associated with the cycle of the moon, as is still popular belief today. This connection between the cycle of the changing of the moon and the menstrual cycle also suggests a connection between the changing of the seasons and the start of a new seasonal cycle. By looking at menstrual cycles as not only a sign of mature fertility but also of the birth of new seasons, the pomegranates association to menstrual blood strengthens its connection to crop and female fertility. The pomegranate juice as menstrual blood

¹⁸³ Whitchurch and Griggs, 225. Early carbonized remains of the pomegranate have been found at Cyprus, suggesting that it may be one of the origin sites.

¹⁸⁴ Marguerite Rigoglioso, "Persephone's Sacred Lake and Ancient Female Mystery Religion in the Womb of Sicily," *Journal of Feminist Studies in Religion* 21(2) (Bloomington, IN: Indiana University Press, 2005), 14.

can then be connected to the idea of fertility, making the fruit appealing as a sign of women's reproductive capacity.

Rigoglioso further suggests that the pomegranate skin is commonly highlighted being used as a birth control as early as archaic Greek periods.¹⁸⁵ The plant's connection to antifertility strengthens the argument of the pomegranate as a symbol of death and life through its power to control new birth. Rigoglioso, Whitchurch, and Griggs all connect the pomegranate to death and fertility through the ritual of Thesmophoria that takes place at the Lake of Pergusa, which includes reenacting the consumption of the pomegranate seeds as Persephone did.¹⁸⁶ This part of the ritual suggests that, for women, use the pomegranate is a symbol of the death of young girlhood, transitioning her into a new life of womanhood, as the pomegranate represents death, rebirth, and fertility.

In rituals similar to Thesmophoria, women are seen as metaphorically bleeding on their menstrual cycle as an embodiment of the earth's rejuvenation; additionally, for this practice women are separated from men and their life at home.¹⁸⁷ This ritual practice mirrors Persephone's tale as she eats the pomegranate as a sign of her menstruation, death of girlhood, and separation from home, and then reenters the world from the underworld as a new woman, thus, giving the rebirth of the earth as well. The separation of the women from men also emphasizes the feminine quality of the

¹⁸⁵ Rigoglioso, 15.

¹⁸⁶ Rigoglioso, 20; Whitchurch and Griggs, 228.

¹⁸⁷ Rigoglioso, 22.

pomegranate. The pomegranate holds an interesting duality that is associated with both the violence of death and the blessing of fertility. Representing the abundance of life, the seeds of the pomegranate further push the notion of male and female duality. While men experience death, only the women are historically connected with the biological creation of new life. Thus, the pomegranate is a representation of the pain of menstruation, childbirth, and rejuvenation of new life, which is a process separate, but still necessary, from the masculine association with the pomegranate as death.

Looking closer at the pomegranate in archaeological burial and tomb excavations, the pomegranate can be analyzed as a symbol of fertility as well as death. Myths used in various religious cultures associate the pomegranate with fertility gods/goddesses. Furthermore, female cultic rituals incorporate the pomegranate as a symbol of female reproduction and bodily autonomy. While the juice of the pomegranate is connected to death through its representation as blood, the juice is also connected to the bleeding of women. The menstrual cycle and crop fertility cycle both connect to the pomegranate through stories such as Persephone and Eve.

Pomegranate as the Cycle of Life

The pomegranate is seen as a dual symbol in several religious cultures; thus, the paradox of life and death can be connected to the overarching symbol of the pomegranate as an image of the circle of life. The use of the pomegranate in different

burial settings is also associated with the transition into a new life or afterlife. One of the most prominent stories that connects to the symbolism of rebirth is that of Persephone, Demeter, and Hades. The story goes: one-day, Persephone was kidnapped by Hades and forcibly brought to the underworld. Demeter, in the midst of her grief and agony, inadvertently kills all crops in the land. Persephone is enticed into eating a pomegranate seed by Hades, who knows the rules of eating in the underworld results in entrapment.¹⁸⁸ Demeter then finds Persephone and demands that she return to earth, creating the seasonal pattern that is known today. The pomegranate is the symbol of Persephone death but also the symbol of her eventual return to earth and the start of new growth. Persephone thus became the symbol of human rebirth from death.

Of significance are two pomegranate amulets found in the inscriptions of an Osirian temple, “where a link between Osiris and resurrection has long been understood.”¹⁸⁹ In Early Egyptian society, there is evidence of cults of fertility surrounding Osiris, his death, and resurrection.¹⁹⁰ The story goes that Osiris, an Egyptian deity, was tricked into a coffin-like box and pushed down the Nile Delta by his brother Seth. Osiris’ wife, Isis, then found him in the box but while she was distracted Seth cut up his body and spread the parts throughout Egypt. Isis then buried

¹⁸⁸ Marilyn Arthur and H.D., “Politics and Pomegranates: An Interpretation of the Homeric Hymn to Demeter,” *Arethusa* 10(1) (Baltimore, MD: The Johns Hopkins University Press, 1977), 29. The number of pomegranate seeds that were eaten is debated in many different versions. No matter the number (1,3, or 6) the same message is clear: the number of seeds equates to the amount of time that is spent in the underworld ($\frac{1}{3}$ of the year, 3 months, 6 months).

¹⁸⁹ Whitchurch and Griggs 225

¹⁹⁰ Farrar, “Egyptian Gardens,” 2.

the remains where she found them, thus creating new growth/life. Moreover, the plants associated with Osiris are typically a symbol of fertility and more accurately resurrection. Furthermore, the use of the pomegranate is also associated with food for the dead such as in the falling seeds in Thesmophoria and in Egyptian tombs. The presence and use of the pomegranate as a food for the dead implies that these religious cultures believed that the dead would rise again in either this world or the next. The pomegranate was used as both a symbol of this momentous crossing over, as well as a starting nutritious food for the new world.

Neolithic Sicilians are known to cover their dead with natural red pigments and juices in order to “signify the return to the bloody realms of the womb.”¹⁹¹ The use of pomegranate juice as blood is already evidently seen in the analysis of the pomegranate as a symbol of death. The Sicilian custom of using red pigment as the blood of the womb also connects the wide use of the pomegranate as a symbol of menstrual blood as well. The red juice of the pomegranate shows the link and mirrored process of both death and new life. The use of the red pigment suggests that death must be an ultimate truth in order to achieve rebirth into a new life or afterlife.

Pomegranate as a Connection to Syncretism

Whitchurch and Griggs states that current evidence indicates that early remains of the pomegranate plant are connected to the Middle Kingdom elite such as the priestly or political

¹⁹¹ Farrar, “Egyptian Gardens,” 15.

class.¹⁹² Whitechurch and Griggs Egyptian site in Fayum shows us a long connection of the pomegranate to several cultures and religions. The pomegranate first arrived in Egypt through trade and kingdom expansion. The use of Constantinian and pagan symbols in the Egyptian grave displays the “growing syncretism between Hellenistic, Egyptian, and Christian practices, and beliefs.”¹⁹³ The use of the pomegranate in this particular grave could have been influenced by the early introduction of the pomegranate into Coptic religious rituals or by Christian influence in later centuries; either appropriation points to the wide and similar significance of the pomegranate to multiple cultural societies.

Additionally, the early Judaic temple of Solomon is another example of the early spread of symbols between cultures. The Etruscan people who were closely connected to the Romans through years of power imbalances used the tomb entry way as a metaphorical entrance into the afterlife.¹⁹⁴ The decoration and frescos surrounding the entry way were meant to help the funeral congregation visualize the transition of the dead to the afterlife.¹⁹⁵ Later during Israelite civilization, the temple door was used as an entry to the new life in the kingdom of God. While the Etruscan tomb is seen as an obvious threshold into the tomb, early Israelite temples dating to around the same era display a

¹⁹² Whitechurch and Griggs, 225.

¹⁹³ Whitechurch and Griggs, 218.

¹⁹⁴ K.A. Rask, “Tomb Door as Passageway: Etruscan Funerary Thresholds Both Real and Symbolic” (presentation, American Academy of Religion Conference, Denver, Colorado, November 19, 2022).

¹⁹⁵ Rask, 202

similar symbolism. As Etruscan tombs used transition markers such as deities and scenes of feast, the Temple of Solomon used the pomegranate as a transition marker on the columns by the entry way. By walking into the temple, the congregation is symbolically leaving death that is associated with the material world and entering the New Kingdom often used to describe afterlife. Inevitable death of the body and rebirth in the new realm is seen in both religious cultures that were closely connected through trade. The pomegranates that are used on Solomon's temples columns can thus be interpreted as a symbol of the transition of the soul from the material world and rebirth into a new kingdom. The pomegranate found in Etruscan tomb entries can be analyzed as a decorative symbol to help the congregation to visualize death and rebirth of the dead.

The connection and syncretism of symbols and rituals can be seen in the ritual of Thesmophoria. The ritual is claimed to have been brought to the Greece women by Egyptian women by Herodotus.¹⁹⁶ This appropriation of the ritual of Thesmophoria highlights the connection between religious practices that the pomegranate is associated with. Whitchurch and Griggs claim that during the festival any pomegranate seed that falls on the ground is left to feed the dead.¹⁹⁷ Just as pomegranate is a symbol of death there is also a connotation that with death comes life or afterlife. Both the Greek women and Egyptian women

¹⁹⁶ Rigoglioso, 20.

¹⁹⁷ Whitchurch and Griggs, 228.

partaking in the ceremony of Thesmophoria would ascribe to the symbol of the pomegranate as a life-giving fruit for those who have been reborn in an afterlife. The joint ritual displays an important share point between religious cultures that likely lead to the syncretism of symbols such as the pomegranate.

Additionally, use of the pomegranate as the Tree of Life in Assyrian imagery and the appropriation into Greek myths as fertility¹⁹⁸ could be argued as a slight shift as similar symbols. Even before Assyrian rule the pomegranate was seen in a Philistine-type decorative context. The bowl found at Tell Halif is connected to ritual offering vessels that associate with influence from the Sea Peoples, who most likely ran into the pomegranate during their seafaring travels. Other influence from Mesopotamian rule would have spread Middle Eastern native plants must further West as suggested in the domestication section of this paper.

In the pomegranate's earliest context among Mediterranean Sea People, not much symbolism is shown due to the lack of archaeological evidence; however, one can see that as pomegranates were traded and spread throughout different societies, pomegranate symbolism emerged, mixed, and solidified. The Assyrian people were known to have used the pomegranate as a decorative motif for women, connecting the fruit to the fertile or life-giving gender at the time. Around the same time, the pomegranate displayed as a campaign conquest in Tuthmosis III's Egyptian garden reliefs. Displaying the fruit as a luxury item that was fought

¹⁹⁸ Whitchurch and Griggs 228.

for implied that in order to have attained a growing fruit, the cost was death. The message of the pomegranate developed from the passage of the fruit through trade and battle. Other artifacts such as pottery from the Levant, Mediterranean, and Egypt highlight the broad use of the pomegranate motif in association with death offerings.

One reasoning behind the beginnings of the pomegranate's image of fertility could be the use of gods and goddesses such as Egyptian Osiris, Phoenician Astarte, and Greek Demeter/Persephone being used as symbols of crop fertility.¹⁹⁹ The Hittite fertility god, Telepinu, myth shows very similar parallels to the disappearance of fertility in crops and the god/goddess, rage and agony, and the eventual rebirth of crop and human life.²⁰⁰ The syncretic myths suggest that there are shared stories through generations that are part of a larger picture than just one motif such as the pomegranate. The pomegranate could have then grown to represent more than just crop fertility and into the human fertility and rebirth as the pomegranate also began to symbolize death is not too far of a stretch. The trade systems of the Bronze Age opened a path for religious cultures to spread and adapt to other various cultures. The interconnected civilizations built off and appropriated ideas for their own religious cultures, including the use of the pomegranate as a symbol of fertility and in a broader sense the use of crop fertility in association with human fertility.

¹⁹⁹ Koenen, 49.

²⁰⁰ Arthur and H.D., 10.

The great popularity of the pomegranate vase may have been one of the reasons that the symbol of the pomegranate also spread across a diverse environment.²⁰¹ Immerwahr's analysis of geometric pomegranate vases touches on the syncretism of cultures at the time of the Late Bronze Age. The pomegranates color, juice, shape, and seeds all attribute to its agreeable use as a symbol of life and death. The pomegranate was a symbol throughout the cultures in the Bronze Age and show a much more connected system of religious syncretism than typically associated with the very distinct cultures of the periods. The pomegranate's categorization as a luxury fruit with unique character made it a perfect object for offerings and ceremonial uses. Looking at the Bronze Age civilizations, there is an obvious connection between the pomegranate and the circle of life. The symbolism associated with the pomegranate is a result of the shared and adapted uses of the pomegranate through several centuries and among several civilizations.

²⁰¹ Immerwahr 408.

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The Case for Combatting Eyewitness Misidentification as a Result of Confidence Inflation

Katie Green

Abstract

Research demonstrates that, in the realm of eyewitness testimony, a witness's confidence in identifying a suspect can increase over time, otherwise known as confidence inflation. This is a result of factors such as post-identification feedback, memory malleability, and repeated testing of face memory. Due to these influences, it has been proposed that confidence is a high predictor of accuracy in eyewitness identification but only at the time that a witness initially identifies a suspect. The drawback to the use of confidence in eyewitness testimony is that the inflated sense of confidence expressed by a witness in a trial is what juries often use to determine whether a suspect is guilty, which is why many misidentifications occur. In order to decrease the number of eyewitness misidentifications, it is proposed that juries should shift to using the initial confidence of a witness as a reliable predictor of accuracy.

Keywords: eyewitness testimony, misidentification, confidence inflation, accuracy

Introduction

Larry Fuller was arrested in April 1981 for attacking and raping a young woman. After serving 26 years in prison, his sentence was dropped when DNA evidence revealed that he was incorrectly identified as the perpetrator.²⁰² When initially identifying Fuller, the victim picked him out of a lineup and stated that she thought he was the man who raped her, but she wasn't positive.²⁰³ When presented with a second lineup, the victim selected Fuller again, but this time with more certainty. Finally, when she made an official statement in court, she never wavered in her confidence that Larry Fuller was the man who committed the crime. If the jurors were informed that Larry Fuller's accuser was not certain that he was the man who raped her when she initially chose him out of a lineup, there is a chance he could have avoided spending 26 years of his life in prison for a crime that he did not commit. Larry Fuller is just one out of thousands of innocent people who have been incorrectly identified and spent many years in jail for crimes they played no part in. The Innocent Project, founded in 1992, is an organization that uses DNA evidence to exonerate those who were wrongfully convicted.

²⁰² *Larry Fuller celebrates thirteen years of freedom today*. Innocence Project. (2020, January 10). <https://innocenceproject.org/cases/larry-fuller/>

²⁰³ Jones, E. E., Williams, K. D., & Brewer, N. (2008). "I had a confidence epiphany!": Obstacles to combating post-identification confidence inflation. *Law and Human Behavior*, 32(2), 164-176. <http://dx.doi.org/10.1007/s10979-007-9101-0>

Measuring Eyewitness Confidence

Out of the hundreds of DNA exoneration cases, high-confidence misidentifications played a role in 70% of these wrongful convictions.²⁰⁴ Before understanding the role that confidence plays in eyewitness misidentification, it is important to know how confidence is defined and measured in the realm of eyewitness testimony. Confidence in eyewitness testimony is the degree to which a witness feels as though they have correctly identified a suspect. A confidence assessment is often completed following the initial identification of a suspect from a lineup and also when identifying the suspect in court. While confidence can be measured using a scale (e.g., rating one's confidence level from 1 to 5), most lineup administrators use a verbal assessment of confidence (e.g., highly confident, somewhat confident, not confident).²⁰⁵ This can come in the form of more detailed verbal confidence ratings or simply asking the witness if they are certain they identified the correct suspect. The measurement of confidence of a witness has a complex relationship with the accuracy of suspect identification, which is why it is an extremely important aspect of eyewitness testimony.

There is a withheld view that the relationship between confidence and accuracy in

²⁰⁴ Wixted, J. T., Mickes, L., Clark, S. E., Gronlund, S. D., & Roediger, Henry L., I., II. (2015). Initial eyewitness confidence reliably predicts eyewitness identification accuracy. *American Psychologist*, 70(6), 515-526. <http://dx.doi.org.ezproxy.lib.ou.edu/10.1037/a0039510>

²⁰⁵ Tekin, E., Lin, W., & Roediger, Henry L., I., II. (2018). The relationship between confidence and accuracy with verbal and verbal + numeric confidence scales. *Cognitive Research: Principles and Implications*, 3, 8. <http://dx.doi.org.ezproxy.lib.ou.edu/10.1186/s41235-018-0134-3>

regard to eyewitness testimony is weak at best. A survey of memory experts reported that 87% agreed with the statement, “An eyewitness’s confidence is not a good predictor of his or her identification accuracy.”²⁰⁶ However, some researchers have argued that a witness’ confidence may be much more reliable than literature portrays it to be. The disconnect between these views lies in measuring the initial confidence of a witness versus the confidence expressed in the courtroom. Due to factors such as the malleability of memory, post-identification feedback, and repeated testing of face memory, there is often an increase in confidence following the initial identification of a suspect. Unfortunately, this inflated confidence is usually present when a witness identifies a suspect in front of a jury. The purpose of this literature review is to not only identify how confidence becomes inflated and how this problem may be prevented but to also advocate for the shift from the use of eyewitness confidence expressed in the courtroom to the confidence level following initial identification.

Causes of Confidence Inflation

Memory Malleability

The artificial strength in confidence that a witness often possesses following their initial identification of a suspect could be a result of the malleable properties of memory. The idea that

²⁰⁶ Gronlund, S. D., & Benjamin, A. S. (2018). The new science of eyewitness memory. In K. D. Federmeier (Ed.), *The psychology of learning and motivation* (Vol. 69); *The psychology of learning and motivation* (Vol. 69) (pp. 241-284, Chapter x, 364 Pages). Elsevier Academic Press, San Diego, CA.

memory is malleable comes from its ability to change and adapt when presented with new, additional information. While the malleability of memory provides the human brain with greater cognitive flexibility, it can also cause people to confidently remember events in their lives that did not actually happen.²⁰⁷ A byproduct of memory malleability is a phenomenon known as the misinformation effect, which occurs when a person's memory recall becomes less accurate due to post-event information. Okado and Stark conducted a study to further investigate the misinformation effect.²⁰⁸ Their participants first witnessed several complex events, one of which was a man stealing a woman's wallet. Following the event, some of the participants received misinformation about what actually occurred (e.g., telling the participant that the woman's arm was hurt during the event instead of her neck). Finally, all of the subjects were asked to recall what happened during the event. Those that received the misinformation recalled it as part of the original event about 47% of the time. The misinformation effect can play a dangerous role when it comes to eyewitness testimony. Because memory is malleable, incorrect information following a traumatic event has the power to convince a witness that they saw someone or something that wasn't actually there. When provided with misinformation,

²⁰⁷ Wixted et al., 2015.

²⁰⁸ Okado, Y., & Stark, C. E. L. (2005). Neural activity during encoding predicts false memories created by misinformation. *Learning & Memory*, 12(1), 3-11.
<http://dx.doi.org.ezproxy.lib.ou.edu/10.1101/lm.87605>

this can increase the confidence that they have in their false recall.

Post-Identification Feedback

Following a witness' initial identification of a suspect, they may receive comments and feedback from the lineup administrator, which is a common cause of confidence inflation. The post-identification feedback effect is described as the change in confidence of a witness following their identification due to administrative feedback or suggestion.²⁰⁹ This false sense of confidence is easily created by giving feedback such as, "Good, you identified the suspect," or, "We thought that he may be the guy."²¹⁰ Luus and Wells conducted a study in which groups of two participants witnessed a staged theft followed by photo lineup identification.²¹¹ Participants who were told that their co-witness had identified the same suspect showed a drastic increase in the confidence they expressed to a police officer. Giving confirmatory feedback may not only increase a witness' confidence in their identification but can also cause them to believe that their view of the crime and the perpetrator was better than it actually was.²¹² Confidence inflation as a result of post-

²⁰⁹ Wells, G. L., & Bradfield, A. L. (1998). "Good, you identified the suspect": Feedback to eyewitnesses distorts their reports of the witnessing experience. *Journal of Applied Psychology*, 83(3), 360-376. <http://dx.doi.org.ezproxy.lib.ou.edu/10.1037/0021-9010.83.3.360>

²¹⁰ Smalarz, L., & Wells, G. L. (2014). Post-identification feedback to eyewitnesses impairs evaluators' abilities to discriminate between accurate and mistaken testimony. *Law and Human Behavior*, 38(2), 194-202. <http://dx.doi.org.ezproxy.lib.ou.edu/10.1037/lhb0000067>

²¹¹ Luus, C. A. E., & Wells, G. L. (1994). The malleability of eyewitness confidence: Co-witness and perseverance effects. *Journal of Applied Psychology*, 79(5), 714-723. <http://dx.doi.org.ezproxy.lib.ou.edu/10.1037/0021-9010.79.5.714>

²¹² Smalarz & Wells, 2014.

identification feedback played a crucial role in one of the more well-known DNA exoneration cases. Ronald Cotton was incorrectly identified for raping a woman named Jennifer Thompson. When she initially chose Cotton out of a lineup, she said, “I think this is the guy.” Following her identification, the detective reassured her and told her that she did well, while also mentioning that he thought Cotton was the perpetrator. By the time Thompson gave her testimony in court, she was absolutely certain that she was raped by Ronald Cotton. This inappropriate inflation of confidence resulting from post-identification feedback could be responsible for Cotton serving 10 years in prison for a crime that he was not responsible for. This further supports the view that juries should be provided with witnesses’ initial confidence ratings in suspect identification.

Repeated Testing of Face Memory

Along with post-identification feedback, repeated testing of face memory can have an impact on a witness’ confidence when selecting a suspect.²¹³ A common byproduct of this repeated testing is known as the mugshot exposure effect. This occurs when a suspect that is previously present in the initial viewing of a series of mugshots is also present in a lineup, which causes a witness to select them as the perpetrator due to the familiarity of their face from their mugshot, not from the event of the crime itself. Deffenbacher et al. conducted a

²¹³ Wixted et al., 2015

meta-analysis of 32 independent tests of the hypothesis that prior mugshot exposure decreases witness accuracy at a subsequent lineup.²¹⁴ With results supporting the proposed hypothesis, they concluded that the repeated testing of face memory can have a serious impact on the confidence of an eyewitness. The Innocence Project contains a case in which an innocent man served 38 years in prison, possibly as a result of the mugshot exposure effect. In 1979, Malcolm Alexander was incarcerated following a deeply flawed, unreliable identification procedure.²¹⁵ Police reports show that the victim “tentatively” chose Alexander out of a photo array lineup but was not certain that he was the man who raped her at gunpoint. The downfall of the identification procedure came three days later when Alexander was the only suspect present in the physical lineup that was present in the photo array. The misidentification of the witness could have resulted from her inability to distinguish whether she recognized Alexander from the photo lineup or the crime itself, which is an unfortunate outcome of the mugshot exposure effect. Repeated testing of face memory is one of the many reasons that confidence inflation occurs, further illustrating that the initial confidence of a witness is the most reliable predictor of accuracy.

Investigator Bias

²¹⁴ Deffenbacher, K. A., Bornstein, B. H., & Penrod, S. D. (2006). Mugshot Exposure Effects: Retroactive Interference, Mugshot Commitment, Source Confusion, and Unconscious Transference. *Law and Human Behavior*, 30(3), 287-307. <http://dx.doi.org/10.1007/s10979-006-9008-1>

²¹⁵ A mistaken identification sent him to prison for 38 years, but he never gave up fighting for freedom. Innocence Project. (2021, October 28). <https://innocenceproject.org/malcolm-alexander-wrongful-conviction-angola/>

While repeated testing of face memory can play a role in confidence inflation, the manner in which lineups are conducted can also have an effect on the initial confidence of a witness. When a lineup administrator knows who the suspect in question is, they can consciously or unconsciously send cues to a witness to increase the likelihood that they will choose a certain suspect, which is known as investigator bias.²¹⁶ The investigator may encourage the witness to take a closer look at a photo of the suspect but tell them to make sure to look at all of the photos when they are looking at photos of non-suspects (i.e., fillers).²¹⁷ They may unconsciously lean forward or smile when the witness is studying the photo of the perceived suspect. In addition to post-identification confidence inflation, if the witness believes that the investigator wants them to choose a certain suspect, it can give them a false sense of confidence in their initial selection. In order to combat investigator bias and confidence inflation, there are recommendations for how lineups should be conducted.

Combating Eyewitness Misidentification

Wells and Seelau suggest simple steps that legal systems could follow in order to reduce

²¹⁶ Phillips, M. R., McAuliff, B. D., Kovera, M. B., & Cutler, B. L. (1999). Double-blind photoarray administration as a safeguard against investigator bias. *Journal of Applied Psychology*, 84(6), 940-951. <http://dx.doi.org.ezproxy.lib.ou.edu/10.1037/0021-9010.84.6.940>

²¹⁷ Kovera, M. B., & Evelo, A. J. (2017). The case for double-blind lineup administration. *Psychology, Public Policy, and Law*, 23(4), 421-437. doi:<http://dx.doi.org.ezproxy.lib.ou.edu/10.1037/law0000139>

eyewitness misidentification.²¹⁸ The first is that eyewitnesses should be informed that the suspect may or may not be present in the lineup. There is a danger of misidentification that exists in any circumstance in which the suspect is not present in the lineup. A witness may believe that it is imperative for them to make an identification of a suspect, which could lead them to select an innocent person. If they are told that the perceived suspect may not be present, it gives them a sense of reassurance that they don't have to choose someone if they do not recognize any of the presented individuals. The second proposed step for a lineup procedure is that the suspect should have similar physical characteristics to others in the lineup. It is not uncommon for the proposed suspect to look similar to the witness' description, however, they should not stand out among the individuals present in the lineup. In their meta-analysis, Fitzgerald et al. compared lineup procedures with low, moderate, or high suspect similarity fillers.²¹⁹ They found that lineups with low similarity fillers were more likely to elicit the identification of a suspect, regardless of whether they were guilty or innocent. The suspect's ability to stand out in a lineup may give the witness a false sense of confidence following their initial identification, which further emphasizes the importance that suspect-fillers look somewhat similar to the proposed suspect.

²¹⁸ Wells, G. L., & Seelau, E. P. (1995). Eyewitness identification: Psychological research and legal policy on lineups. *Psychology, Public Policy, and Law*, 1(4), 765-791. <http://dx.doi.org.ezproxy.lib.ou.edu/10.1037/1076-8971.1.4.765>

²¹⁹ Fitzgerald, R. J., Price, H. L., Oriet, C., & Charman, S. D. (2013). The effect of suspect-filler similarity on eyewitness identification decisions: A meta-analysis. *Psychology, Public Policy, and Law*, 19(2), 151-164. <http://dx.doi.org/10.1037/a0030618>

A third, and one of the most important aspects of an unbiased lineup procedure, is that it is orchestrated in a manner in which neither the administrator nor the witness knows who the suspect in question is. This is known as a double-blind lineup. The implementation of double-blind procedures can help ensure that the witness' identification and immediate confidence rating reflect a memory-based decision, one that is not subject to the influence of the lineup administrator.²²⁰ The use of a double-blind lineup administration is not a new or unheard-of strategy; however, it is not widely used. A survey conducted by the Police Executive Research Forum reported that 69% of photo arrays are conducted by a nonblind administrator.²²¹ Despite recommendations from copious amounts of psychological research, it is extremely common for the individual conducting the lineup to know who the suspect is. Double-blind testing is an invaluable way to reduce confidence inflation and investigator bias, and it has the potential to significantly decrease the number of eyewitness misidentifications.

The goal of this literature review is not to recommend the relationship between confidence and accuracy in eyewitness testimony be disregarded completely. Instead, it is to argue that

²²⁰ Wells, G. L., Kovera, M. B., Douglass, A. B., Brewer, N., Meissner, C. A., & Wixted, J. T. (2020). Policy and procedure recommendations for the collection and preservation of eyewitness identification evidence. *Law and Human Behavior*, 44(1), 3-36. <http://dx.doi.org.ezproxy.lib.ou.edu/10.1037/lhb0000359>

²²¹ Police Executive Research Forum. (2013). A national survey of eyewitness identification procedures in law enforcement agencies. Retrieved from http://www.policeforum.org/assets/docs/Free_Online_Documents/Eyewitness_Identification/a%20national%20survey%20of%20eyewitness%20identification%20procedures%20in%20law%20enforcement%20agencies%202013.pdf

because this relationship is significantly more reliable at the time of initial identification, there needs to be a shift from the use of courtroom confidence to the use of initial confidence as a reliable predictor of accuracy.²²² Berhman and Davey conducted an archival analysis using files from the Sacramento City Police Department that illustrates how a measure of initial confidence can be a strong predictor of identification accuracy.²²³ They examined 58 live lineups conducted for crimes committed between 1987 and 1998 and the witnesses' initial confidence levels. Out of these lineups, 29 of the identifications were of the proposed suspect while 14 were filler identifications. Since 14 of the lineups resulted in the identification of a filler, one could conclude that eyewitness memory is not entirely reliable. However, when examining the initial confidence level of the witnesses in these cases, the relationship between identification and accuracy shifts. Following their data analysis, Berhman and Davey found that almost all the filler identifications were made with low confidence, while 18 out of 19 high-confidence identifications correctly identified the suspect.²²⁴ Statistically, then, initial confidence can be a reliable predictor of accuracy in eyewitness testimony and, therefore, supports the reliability of eyewitness testimony.

²²² Garrett, B. L. (2011). *Convicting the innocent: Where criminal prosecutions go wrong*. Harvard University Press, Cambridge, MA. <http://dx.doi.org/10.4159/harvard.9780674060982>

²²³ Behrman, B. W., & Davey, S. L. (2001). Eyewitness identification in actual criminal cases: An archival analysis. *Law and Human Behavior*, 25(5), 475-491. <http://dx.doi.org/10.1023/A:1012840831846>

²²⁴ Behrman, B. W., & Davey, S. L. (2001).

Due to the data-based support for the idea that initial high confidence is a reliable predictor of accuracy, prior research provides different recommendations for how the criminal justice system can place a greater emphasis on the initial confidence of a witness instead of their expression of confidence in the courtroom. In the case of confidence inflation in the courtroom, a juror may not automatically discredit a witness's testimony, which is why it is important for them to be aware of possible confidence inflation before trial.²²⁵ It is essential that a judge takes all necessary steps to make juries aware of prior identifications, including the time frame and manner in which lineups were conducted.²²⁶ Providing this information prior to trial would give the jury time to assess the identification of a suspect and determine if there is a possibility that the witness has experienced confidence inflation. One of the recommendations for how the presentation of evidence to a jury could be modified in order to examine initial eyewitness confidence is to present a video recording of the witness during the initial lineup selection.²²⁷ If the juror can view the initial confidence of a witness and compare it to the confidence level expressed in court, it may be easier for them to determine whether or not the testimony is a reliable predictor of guilt. There has been little research to test the effectiveness of this method, however, it would

²²⁵ Jones, E. E., Williams, K. D., & Brewer, N. (2008). "I had a confidence epiphany!": Obstacles to combating post-identification confidence inflation. *Law and Human Behavior*, 32(2), 164-176. <http://dx.doi.org/10.1007/s10979-007-9101-0>

²²⁶ Wixted et al., 2015

²²⁷ National Research Council. (2014). Identifying the culprit: Assessing eyewitness identification. Washington, DC: The National Academies Press.

ideally provide the judge with concrete documentation of the initial confidence level of the witness in case inflated confidence was present during their courtroom testimony.

Implementation of New Identification Methods

In light of these findings, some court systems have begun to implement new practices into their eyewitness identification protocol that focus on initial eyewitness confidence levels. In 2012, the New Jersey Supreme Court ruled that if evidence of confidence inflation of a witness can be provided, a pretrial hearing must be conducted to determine the authenticity of the testimony.²²⁸ Due to the fact that a juror may not discredit a witness's testimony in the case of confidence inflation, a pretrial hearing gives the jury the ability to assess possible misidentification before the expression of confidence in the courtroom. In 2017, The U.S. Department of Justice (DOJ) drafted a document presenting new photo array procedures that focus on initial eyewitness confidence.²²⁹ Prior to this document, the last time photo array procedures had been mentioned by The Department of Justice was in 1999. Since research on identification procedures has evolved considerably in the 21st century, it is important that courtroom procedures evolve as well. Included in the DOJ document are policies and procedures for conducting lineups (e.g., double-

²²⁸ New Jersey Courts. (2012, July 19). Supreme Court releases eyewitness identification criteria for criminal cases. Retrieved from <http://www.judiciary.state.nj.us/pressrel/2012/pr120719a.htm>

²²⁹ Yates, S. Q., (2017). Memorandum for heads of department law enforcement components. Washington D.C: U.S. Department of Justice. Retrieved from <https://www.justice.gov/file/923201/download>

blind testing, methods of presenting photographs, and use of administrator feedback). In addition, it states that in any instance where a witness identifies a photo of a suspect, their confidence level should be documented. This can be accomplished via video or audio recording of the identification or immediate verbatim documentation of both the identification of the suspect and confidence level.²³⁰ In response to research and recommendations, many court systems have evolved and implemented new practices in order to battle the negative repercussions of confidence inflation.

Conclusion

High-confidence eyewitness misidentification is responsible for the incarceration of countless innocent people and is therefore an issue of utmost importance. Many scholars believe that due to the number of suspect misidentifications, eyewitness confidence should not be considered a reliable predictor of accuracy. However, many of these individuals fail to recognize that confidence is not a fixed, stable judgment resistant to change. Therefore, the confidence level presented by a witness in court when identifying a suspect may not be the same level of confidence they had when they made an initial identification. There are many factors that can contaminate the confidence of a witness, such as the malleability of memory, post-identification feedback, and repeated testing of face memory. Therefore, many researchers have begun

²³⁰ Ibid.

to shift their focus toward measuring initial eyewitness confidence as a reliable predictor of accuracy. Because the manner in which lineups are conducted can negatively impact the confidence of a witness, researchers have proposed new lineup procedures that help prevent confidence inflation, such as double-blind testing. Courtroom procedures have also begun to place a greater emphasis on the use of initial eyewitness confidence, instead of heavily relying on their expression of confidence in the courtroom. While there is no perfect solution for eyewitness misidentification, there have been many strides taken to prevent more cases like Larry Fuller, Ronald Cotton, and Malcolm Alexander.

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