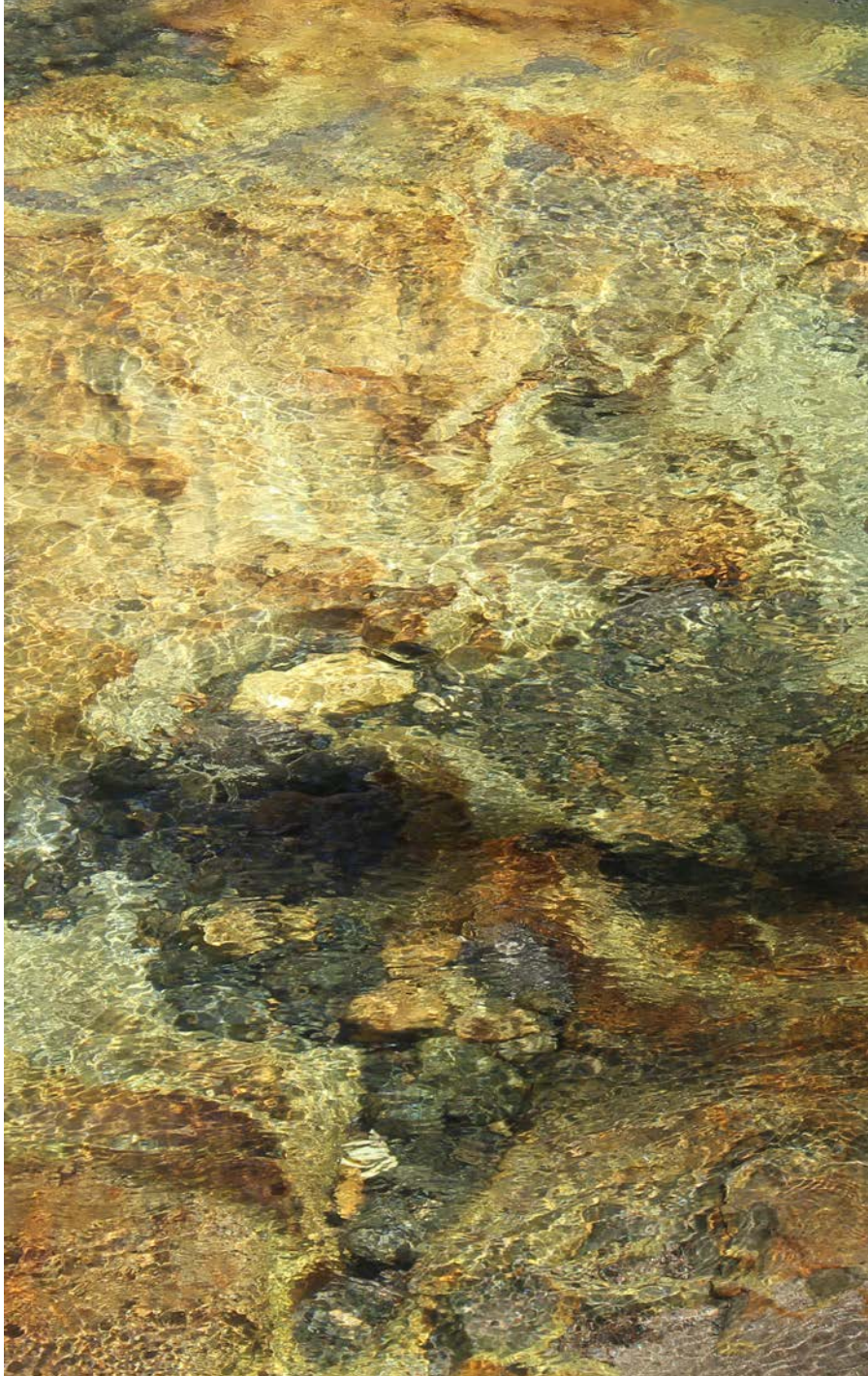


Undulations



2018

Undulations

A Journal of Exploratory Research and Analysis

The articles published here reflect the Capstone Research efforts of graduating seniors in the Stanislaus State University Honors Program. They present projects conceived from personal academic interests and mentored by faculty members familiar with the research and scholarship driving these efforts of discovery.

As this research is born of the intersection of personal interests and scholarly preparation, each student's work reflects the undulation of intellectually inquiry, tracing the peaks and troughs along which the wave of their interests travels toward the culmination of their investigation. In some cases topics coalesce into an energetic harmony that amplifies the urgency of the problem at hand. In others, diverging results create a dynamic tension that resonates far beyond the original scope of the research. In the course of their research, students are confronted by a world of data, questions, critiques, and alternate visions that often take them by surprise. They come to realize that scholarly inquiry acts not as a perfectly polished mirror that reflects a hypothesis back virtually unchanged, but rather as a prism that shatters their current thinking into constituent parts that travel in their own directions before coming back together in unanticipated ways.

When they rise to the challenge, students reflect on these altered visions and use them to bring their hypotheses into greater alignment with the world beyond the looking-glass. Sound research emerges

from *growth* in perspective, not stasis, and the goal of good mentoring is to cultivate an openness to the topsy-turvy, dizzyingly disorienting results their work may bring. We thank our faculty mentors (more than 100 so far), who have worked with our Capstone students during the past seventeen years to help them frame, conduct, and enthusiastically embrace the results of effective research projects.

The 2017-2018 academic year marks our largest crop of Honors Capstone Projects to date, with 31 seniors presenting research at our 17th Annual Honors Capstone Conference and 29 of those presenters publishing their investigations in this journal. Students pursued their work multiple sections of our Honors courses, reshuffling as class times and schedules shifted each semester to discover new colleagues and connections in each iteration. In spite of the large numbers and the dynamic cohorts, this year's projects coalesced around several important themes, ranging from zoological studies, topics related to learning styles and higher education consumerism, technologically driven efforts to identify and model everything from faces to fake news on-line, philosophical inquiry, literary criticism and censorship, and the biological and social dimensions of autism spectrum disorders. All of these themes are explored in the pages that follow. We thank our students for the journey on which they have taken us and look forward to future installments as their work progresses.

The Honors Capstone Project

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

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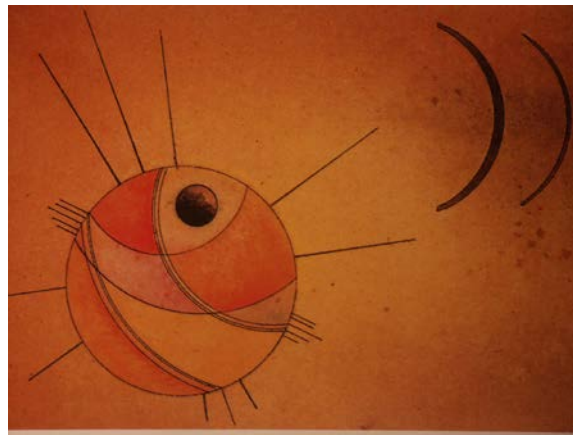
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HONORS PROGRAM COMMUNITY STATEMENT

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



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

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Faster face detection using Convolutional Neural Networks & the Viola-Jones algorithm

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Abstract

If you have ever used social media, a digital camera, or a cell phone, chances are you have encountered face detection more than once. Popular social media applications ranging from Facebook to Snapchat use face detection for several of their popular features such as tagging friends and applying filters. Face detection is defined as computer technology that is used to detect human faces in digital images. There are various computer algorithms that are employed in the field of face detection, but this paper will focus on two of the most popular methods: Convolutional Neural Networks and the Viola-Jones algorithm. The motivation for this paper is a general curiosity about face detection in everyday life as well as a curiosity about how face detection algorithms work, in my classes so far I have talked about the structure of different types of computer systems but I have never delved into algorithms for these systems. This project offered the opportunity to not only learn about face detection but also delve into the world of computer algorithms.

Keywords: social media, privacy, face recognition,

Introduction

Face detection is something that is prevalent in our lives but also something many technology users have probably never thought about in depth. If you've ever used a digital camera, the camera on a phone, Facebook's tagging feature, or the social media app Snapchat, chances are you have encountered face detection before. Face detection is the application of computer technology to detect faces in digital images. All of the aforementioned apps and products use some form of facial detection, whether that be introducing tagging features, filters for pictures, or even just improving the quality of a photo. Given the prevalence of these products in day-to-day life, the digital industry is rapidly trying to improve these features in order to provide the best service. Because of this digital race, products such as the iPhone X have implemented new face detection and recognition software. Two of the most widely incorporated face detection methods at the moment are the Viola-Jones algorithm and Convolutional Neural Networks.

Background

The two methods that will be discussed are the Viola-Jones algorithm and Convolutional Neural Networks. In their 2001 paper *Robust Real-Time Object Detection* Paul Viola and Michael Jones proposed a visual object detection framework that was

capable of fast image detection (1-16). At the time it was proposed this algorithm was game-changing given that it was the first object detection framework that provided "competitive object detection rates in real-time" (Ephraim, Hemmelman, & Siddiqi, 2009). Viola and Jones are largely credited with inspiring a new wave of face detection methods. One product of this face detection wave were Convolutional Neural Networks (CNNs). While the Viola-Jones algorithm offered high accuracy for frontally positioned faces, it proved to be less accurate if the same faces were slightly tilted or if a side profile was given. What CNNs offered was not only fast detection, but a more diverse capability when it came to facial positioning (Farfadi, Aberian, & Li, 2015). While CNNs were able to improve upon this fault in the Viola-Jones algorithm, this does not mean the Viola-Jones algorithm is a completely inferior method.

The Viola-Jones Algorithm

The way that the Viola-Jones algorithm actually works is through the execution of four main steps: Haar-like Features, Integral Image, Adaboost Training, and the attentional cascade (Viola & Jones, 2001). The first step, Haar-like features, are a set of rectangular digital image features that break up the image into multiple sets of "two adjacent rectangles located at any scale and position within an image" (Ephraim,

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Himmelman, & Siddiqi, 2009). These rectangles are then applied to the image that has been opened within the program. In Figure 1 the Haar-like features are applied to the image. As demonstrated, there is first

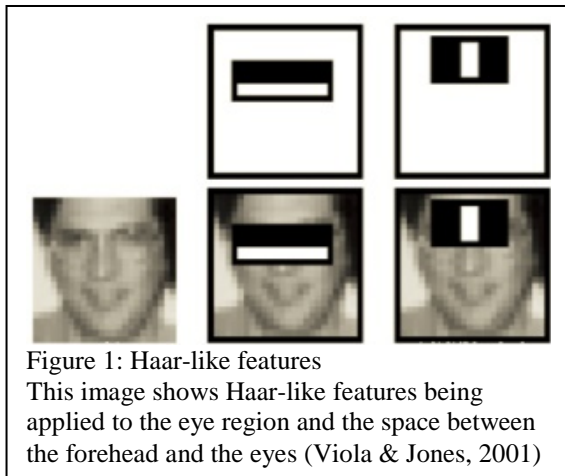


Figure 1: Haar-like features
This image shows Haar-like features being applied to the eye region and the space between the forehead and the eyes (Viola & Jones, 2001)

one main region that is being examined, the area from the forehead to the eyes. This region is selected given that the region of the eyes is darker than the region of the nose and cheeks so if the Haar-like features can be matched then the image can go to the next step with the Adaboost training. What Adaboost training does here is to better define the region from the eyes to the cheeks. The way it does this is by employing a learning algorithm that is used to “teach” the program to look over a set of possible areas and then choose the areas with the “best” features resulting in a reduced image with more defined regions (Viola & Jones, 2001). After the features are selected they are put through the Adaboost learning algorithm to narrow down the number of features that are looked at and then passed on to the cascading stage. In more broad terms, the Adaboost training makes sure that the region that is being examined is as precise as possible in order to help obtain the best accuracy. The last step is the attentional cascade. During this step, the program is trying, again, to maintain the smallest error percentage rate as possible. In order to do this, the attentional cascade’s main focus is to eliminate as many false positives as possible. In practice, for instance, the initial steps identify an object, such as a bush, as a potential face then the attentional cascade takes the bush and discards it as a viable option. Decreasing the number of possible faces not only helps decrease false positives, it also helps to increase the number of correct detections. The Viola-Jones method, although it has a high accuracy rate, does come at the price of longer computation time. In contrast, CNNs have addressed computation time concerns and have successfully improved upon them.

Convolutional Neural Networks

Convolutional neural networks (CNNs) work in a similar way to the Viola-Jones method at least conceptually. So what is different? While both methods work in a series of steps, the steps in the Viola-Jones method are set whereas the steps in CNNs are much less structured. Although there is a general sense of what types of steps exist, the order is not uniform; additionally some steps are capable of running concurrently. This might seem counter intuitive given that the results of one step are passed on to the next step, but the fact that there are usually multiple pass-throughs of the various steps makes sure every step has the correct information for its execution. There are four basic steps used in CNNs: convolution, pooling, and ReLU (“How do” 2016).

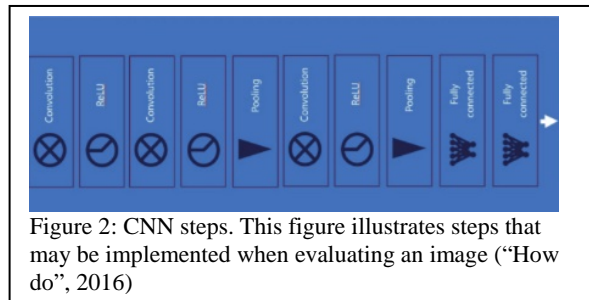


Figure 2: CNN steps. This figure illustrates steps that may be implemented when evaluating an image (“How do”, 2016)

Figure 2 illustrates a sample path a CNN might follow when evaluating an image. Convolution is the step that involves the most math, so when this step first is encountered the program does not know what it is looking for; in other words, it does not know where the face is. The convolution step is trained to recognize faces, so when a new image is inserted into the document the convolution step uses its previous knowledge to test where the faces might be. The math, is, in short, multiplying each pixel in the feature by the value in the corresponding pixel in the image. The answers are then divided by the total number of pixels in the image. Every matching pixel results in a value of 1 so anything else is -1. In Figure 3 a white cross is the item that is being looked at. For every pixel that matches the white cross, a value of 1 is given and the rest of the black pixels are given a value of -1. The CNN does this simple math over and over until it matches the features to a spot on the image. After the convolution step completes once, it must repeat itself multiple times until it has the desirable number of possible locations narrowed down. From here the pooling phase shrinks the image down enough to keep all possible features but still narrow the window of possible locations of the face.

The next step is the Rectified Linear Units or ReLU. In this step all negative features from the picture are changed to zeros which is mostly a step to

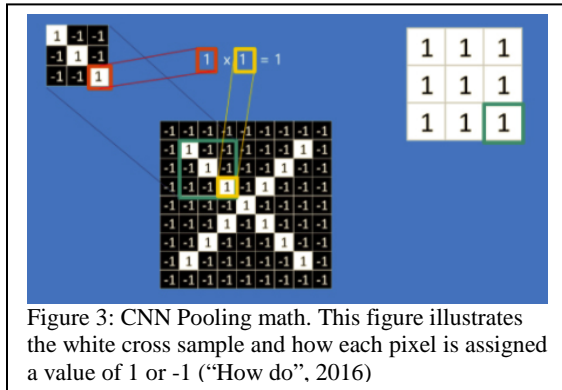


Figure 3: CNN Pooling math. This figure illustrates the white cross sample and how each pixel is assigned a value of 1 or -1 (“How do”, 2016)

keep the CNN mathematically sane by keeping the CNN from approaching infinity (“How do”, 2016).

The final layer is the fully connected layers; this final layer is the layer that gets the final say as to whether or not the final selection of features is correct. For every value that is output by the previous steps it gets a vote as to whether or not the value matches up with the image value.

For example, let’s say there is a CNN that is trained to find eye positions. The first step would look through the image and find any possible location of the eyes. The program will scan all of the pixels in the image and once it has done this the pooling step eliminates areas that it does not believe are the eye region. If the picture being evaluated had been taken outdoors, the program removes the background and the bushes and keeps the entire facial region. The ReLU step will take only the values that were picked out from the photo that were negative and change them to zero. Conceptually there is no change to the image that is being processed, the area that is being examined has not changed and the entire face is still considered a possible location. After the initial pass-through the program will go through the steps again where the region that is being examined is shrinking with each pass-through until a small enough region has been identified and the program can proceed to the last step. The final step, the fully connected layers, will take a look at all of the values assigned to the selected part of the image and then will reference back to its training and try to closely match the values of what should be eyes to the values that it knows are eyes. If, for example, the eye region has pixel size of 0.11 in the training examples and the image that was scanned has a value of 0.14 the program will keep that region as a possibility, if it does not then the program will discard it. While this method provides for the analysis of a broader set of facial positions, the multiple pass-throughs CNNs must go through create a lot of overhead and thus require more space on the computer’s memory. Both the Viola-Jones algorithm and CNNs have their strengths, whether that be with

respect to accuracy or computation time. They do, however, both lack efficiency in some areas as well.

Comparison

While there exist similarities between the Viola-Jones algorithm and Convolutional Neural Networks, they do both differ in a few areas. For one, the Viola-Jones algorithm is not able to detect faces in varied positions. If the face is not presented in a front-facing position with proper lighting, the accuracy of the results drops dramatically (Farfadi, Saberian, & Li, 2015). The Viola-Jones algorithm’s Adaboost training is also not designed to get better results, but rather to have less error. Lawrence et al. state that a prevalent problem in face detection is the fact that “there are not enough training points...to allow accurate estimation of class probabilities throughout the input space” (1997). This means that some applications have a less extensive list of acceptable facial positions because a more extensive list would compromise even more computational memory. Some of these varying positions range from a slight head tilt to low lighting. The Viola-Jones algorithm encounters this problem because their Haar-like features do not map very well to varying positions. By contrast, CNNs have the ability to detect faces in different positions (including side views) and different lighting scenarios, and therefore CNNs are much more diverse in how they correctly handle their input. Figure 4 shows how CNNs are able to detect faces in varying positions and lighting situations. By contrast, the Viola-Jones algorithm can only detect well-lit and front facing faces. Another difference is the amount of space needed to run each program. Given that Convolutional Neural Networks require multiple pass-throughs and therefore store large amounts of information, CNNs require much more space locally than the Viola-Jones algorithm (Hanlon, n.d.). This becomes important when companies are looking to implement face

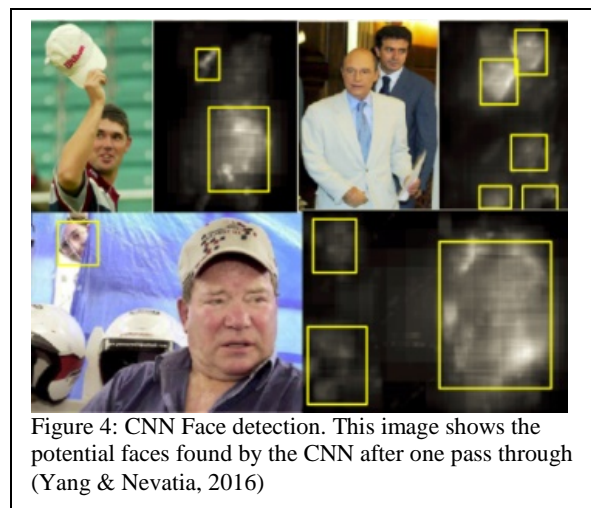


Figure 4: CNN Face detection. This image shows the potential faces found by the CNN after one pass through (Yang & Nevatia, 2016)

detection algorithms in mobile devices given that the amount of space provided by a phone chip is much more limited than that of a computer chip. Given this, the way that each of these methods is implemented is impacted significantly.

Discussion

As previously stated, the use of CNNs requires a larger storage capacity to run than does the Viola-Jones algorithm. Because of this, the places where CNNs can be implemented correctly become limited. Therefore, while CNNs are faster and much more reliable in terms of accuracy, the Viola-Jones algorithm is still widely used today. Two modern products using the Viola-Jones algorithm are various models of point-and-shoot digital cameras and the social media app Snapchat (Q, 2017). In the case of the Snapchat app, the user is meant to be facing the camera frontally in order to apply certain filters to the user's face and, given the fact that the app only runs on cell phones, the use of the Viola-Jones algorithm was a clear choice. In contrast, CNNs are rapidly showing up in newer phones such as Apple's iPhoneX and Facebook's tagging protocol (Chamary, 2017). Apple's newest iPhone model is rumored to run its face recognition software using some form of a neural network while Facebook's CNN architecture is called DeepFace ("Top 8", 2015). These two uses are also obvious choices given that, in the case of the iPhone, one of their main selling points is that the facial recognition is applicable in all conditions, including low lighting, and that it should even work if the user is wearing sunglasses. If the iPhone had used the Viola-Jones algorithm then the promise of multiple angle recognition as well as low lighting recognition would be greatly compromised. The only way to guarantee these features actually work would be to use CNNs instead of the Viola-Jones algorithm. Facebook's algorithm would work in a similar way when tagging people in photos given that, when the feature debuted, cameras were not equipped to produce the high-quality images they do today, so low lighting was a given. The use of CNNs makes sense for both Facebook and the newest iPhone.

A problem that CNNs have encountered, however, is limits on both computational memory and physical memory, but as the accuracy of CNNs is proven in various products, more and more companies are equipping their products to support CNNs high memory occupancy. This proves that the direction companies are moving prioritizes versatile detection over accuracy. Given that technology is improving each day, it probably won't be long before CNNs come equipped with the same level of accuracy as the Viola-Jones algorithm offers.

The Merger

In order to allow for less memory usage and computational run-time, one approach would be to use aspects of the Viola-Jones algorithm in conjunction with Convolutional Neural Networks. We have already established the repetitiveness of the convolution step of CNNs largely fills the memory after the first step. The Viola-Jones algorithm's use of Haar-like features relies on a similar idea as convolution does but does not come with the same memory usage. As in CNNs, the Haar-like features and integral image go through each section of the image in order to correctly identify where possible known features are. If it were possible to use Haar-like features as a replacement for some of the convolution, not only would CNNs be as accurate as the Viola-Jones algorithm, it would also have the potential to decrease how much memory is required to apply CNNs. Replacing some of the CNN architecture would help improve accuracy of front face detection and keeping some of the CNN architecture would help reduce the length of time the program occupies the computer's RAM. There have already been similar approaches in taking aspects from the Viola-Jones algorithm and applying it to CNNs. Li, Lin, Shen, Brandt, & Hua (2015) used a cascade architecture in order to better reject false positives and eliminate background noise in the photos. Yang & Nevatia (2016) used a convolutional cascade in order to better zoom into the faces and used it to train the network in making these distinctions. While many face detection methods have used the cascade CNN combination, these combinations do not address the problem of the large memory requirements for CNNs.

In their paper *Compact Convolutional Neural Network Cascade for Face Detection*, Kalinovskii and Spitsyn (2016) propose an idea to help reduce the amount of computational complexity that is needed when applying CNNs for face detection (p.1). Kalinovskii and Spitsyn's idea is to limit the number of parameters by removing the fully connected layers so that the CNN does not take up too much of the computational memory for too long of a time. They explain that, due to the natural parallelism of CNNs, if you were to reduce the amount of time a process uses computational memory the accuracy shouldn't be compromised if done well. This means their approach keeps accuracy while improving performance time.

Another approach to reducing the amount of computational memory was proposed by Bong, Choi, Kim & Yoo and addresses the problem of computational memory specifically in cell phones (2017, p.30). Bong et al. propose that the hardware be changed first, in order to implement an always-on face detection using Viola-Jones (32). This approach reduces the restrictions on the amount of computational memory the software can use at one

time. While this idea is potentially revolutionary for cell phones, the question of whether it would be applicable to other forms of technology remains.

If a company is not producing a cell phone product, a final approach that is considered comes from Sarwar, Panda, & Roy (2017) from Purdue University. In their paper *Gabor Filter Assisted Energy Efficient Fast Learning Convolutional Neural Networks*. They propose reducing the memory required by CNNs by literally reducing the amount of work a CNN can do at a time (p.1). They explain that, while it is common to try and reduce the amount of testing a CNN does, their approach is to instead reduce the amount of training a CNN needs (p. 1). Sarwar, Panda, & Roy propose an idea of incorporating Gabor Filters into the testing phase rather than the CNN go through multiple training algorithms. A Gabor Filter is an image texture analysis filter that basically tells the user if what they're looking for is potentially there. Similarly to how Viola-Jones algorithm looks for specific facial features, the Gabor Filter looks for specific textures in an image (Murthy, 2015).

After analyzing all 3 proposals, one different proposal can be constructed. Similar to how Kalinovskii and Spitsyn reduce the amount of time by removing the fully connected layer, I propose we reduce another step in the CNN process, the training or convolutional step. Like Sarwar et al., I propose using a filter to reduce the amount of computational memory needed for CNN training but, instead of using a Gabor Filter, I would use Viola-Jones' Haar like features. In doing so, the CNN would run for less time and would also have the trusted accuracy that comes with using the Viola-Jones algorithm. A potential problem with using Haar-like features would be the real possibility that by, incorporating the Haar-like features into CNNs, the speed of detection would decrease. Because CNNs do so much in so little time, the drawback of possibly slowing down the process by introducing a new concept is real. However, the inherent rapidness of CNNs could prevent this effect from actually being impactful and, by minimizing the parameters of the verification in the Fully Connected Layers, speed should not be largely impacted. No matter the effects, tackling the problem of memory usage by CNNs is a problem worth looking into if the face detection industry is to help improve everyday products.

Copyright Law Compliance

In a world where technology is constantly changing and so much information is shared through various mediums including the internet, one must be aware of copyright protection laws when creating software. According to the U.S. Copyright Office, while copyright law protects authored works, it does not protect "ideas, concepts, systems, or methods of

doing something" ("What does", n.d.). With this in mind program designers must still be wary of how they take inspiration from previous programs. According to David Carnes of Legalzoom.com (2017), copyright law cannot prevent you from creating your own software for a similar product "as long as you don't copy the algorithm used in that product". Since the Viola-Jones algorithm is regularly incorporated into face detection software, the process of acquiring permission to incorporate it into this potential hardware shouldn't be a difficult process. From there, the programmer would need to figure out the best way to condense the parameters of the CNN in a unique way. As long as the programmer is aware of the limitations on sharing ideas and takes the correct preventative measure to comply with copyright law, copyright infringement should not be a problem.

Conclusion

When looking at the Viola-Jones algorithm and Convolutional Neural Networks for face detection, it is difficult to say which one is best overall. Both methods have strengths and weaknesses when it comes to certain areas of face detection. While CNNs are much faster, they do require more memory space and are therefore are more expensive to implement. The Viola-Jones algorithm is older but given its minimal memory requirement it is implemented much more easily. The next best thing would be to implement some features from the Viola-Jones algorithm along with the Convolutional Neural Networks. While there has been some talk of implementing CNNs using Viola-Jones' cascading feature, the issue of CNNs accessing too much RAM is a constant problem. This paper proposes a way to combine the two methods, however, proper experimentation and development of this idea is beyond the scope of this project. The hope for the future is that this paper inspires more conversation and experimentation into decreasing the amount of space required to implement CNNs without compromising speed and accuracy.

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Fake news detection in social media

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Abstract

Due to the exponential growth of information online, it is becoming impossible to decipher the true from the false. Thus, this leads to the problem of fake news. This research considers previous and current methods for fake news detection in textual formats while detailing how and why fake news exists in the first place. This paper includes a discussion on Linguistic Cue and Network Analysis approaches, and proposes a three-part method using Naïve Bayes Classifier, Support Vector Machines, and Semantic Analysis as an accurate way to detect fake news on social media.

Keywords: fake news, false information, deception detection, social media, information manipulation, Network Analysis, Linguistic Cue, Fact-checking, Naïve Bayes Classifier, SVM, Semantic Analysis

Introduction

How much of what we read on social media and on supposedly “credible” news sites is trustworthy? It is extremely easy for anyone to post what they desire and although that can be acceptable, there is the notion of taking it a step too far, such as posting false information online in order to cause a panic, using lies to manipulate another person’s decision, or essentially anything else that can have lasting repercussions. There is so much information online that it is becoming impossible to decipher the true from the false. Thus, this leads to the problem of fake news.

Literature review

What is fake news? Fake news is the deliberate spread of misinformation via traditional news media or via social media. False information spreads extraordinarily fast. This is demonstrated by the fact that, when one fake news site is taken down, another will promptly take its place. In addition, fake news can become indistinguishable from accurate reporting since it spreads so fast. People can download articles from sites, share the information, re-share from others and by the end of the day the false information has gone so far from its original site that it becomes indistinguishable from real news (Rubin, Chen, & Conroy, 2016).

Significance

Using social media as a medium for news updates is a double-edged sword. On one hand, social media provides for easy access, little to no cost, and the spread of information at an impressive rate (Shu, Sliva, Wang, Tang, & Liu, 2017). However, on the other hand, social media provides the ideal place for the creation and spread of fake news. Fake news can become extremely influential and has the ability to spread exceedingly fast. With the increase of people using social media, they are being exposed to new information and stories every day. Misinformation can be difficult to correct and may have lasting implications. For example, people can base their reasoning on what they are exposed to either intentionally or subconsciously, and if the information they are viewing is not accurate, then they are establishing their logic on lies. In addition, since false information is able to spread so fast, not only does it have the ability to harm people, but it can also be detrimental to huge corporations and even the stock market. For instance, in October of 2008, a journalist posted a false report that Steve Jobs had a heart attack. This report was posted through CNN’s iReport.com, which is an unedited and unfiltered site, and immediately people retweeted the fake news report. There was much confusion and uncertainty because of how widespread it became in such a short amount of time. The stock of Job’s company, Apple Inc., fluctuated dramatically that day due to one false news report that had been mistaken for authentic news reporting (Rubin, 2017).

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However, the biggest reason why false information is able to thrive continuously is that humans fall victim to Truth-Bias, Naïve Realism, and Confirmation Bias. When referring to people being naturally “truth-biased” this means that they have “the presumption of truth” in social interactions, and “the tendency to judge an interpersonal message as truthful, and this assumption is possibly revised only if something in the situation evokes suspicion” (Rubin, 2017). Basically humans are very poor lie detectors and lack the realization that there is the possibility they are being potentially lied to. Users of social media tend to be unaware that there are posts, tweets, articles or other written documents that have the sole purpose of shaping the beliefs of others in order to influence their decisions. Information manipulation is not a well-understood topic and generally not on anyone’s mind, especially when fake news is being shared by a friend. Users tend to let their guard down on social media and potentially absorb all the false information as if it were the truth. This is also even more detrimental considering how young users tend to rely on social media to inform them of politics, important events, and breaking news (Rubin, 2017). For instance, “Sixty-two percent of U.S. adults get news on social media in 2016, while in 2012, only fort-nine percent reported seeing news on social media,” which demonstrates how more and more people are becoming tech savvy and relying on social media to keep them updated (Shu et al., 2017). In addition, people tend to believe that their own views on life are the only ones that are correct and if others disagree then those people are labeled as “uninformed, irrational, or biased,” otherwise known as Naïve Realism (Shu et al., 2017).

This leads to the problem of Confirmation Bias, which is the notion that people favor receiving information that only verifies their own current views. Consumers only want to hear what they believe and do not want to find any evidence against their views. For instance, someone could be a big believer of unrestricted gun control and may desire to use any information they come across in order to support and justify their beliefs further. Whether that is using random articles from uncredible sites, posts from friends, re-shared tweets, or anything online that does agrees with their principles. Consumers do not wish to find anything that contradicts what they believe because it is simply not how humans function. People cannot help but favor what they like to hear and have a predisposition for confirmation bias. It is only those who strive for certain academic standards that may be able to avoid or limit any biasness, but the average person who is unaware of false information to begin with will not be able to fight these unintentional urges.

In addition, not only does fake news negatively affect individuals, but it is also harmful to society in the long run. With all this false information floating around,

fake news is capable of ruining the “balance of the news ecosystem” (Shu et al., 2017). For instance, in the 2016 Presidential Election, the “most popular fake news was even more widely spread on Facebook” instead of the “most popular authentic mainstream news” (Shu et al., 2017). This demonstrates how users may pay more attention to manipulated information than authentic facts. This is a problem not only because fake news “persuades consumers to accept biased or false beliefs” in order to communicate a manipulator’s agenda and gain influence, but also fake news changes how consumers react to real news (Shu et al., 2017). People who engage in information manipulation desire to cause confusion so that a person’s ability to decipher the true from the false is further impeded. This, along with influence, political agendas, and manipulation, is one of the many motives why fake news is generated.

Contributors of fake news

While many social media users are very much real, those who are malicious and out to spread lies may or may not be real people. There are three main types of fake news contributors: social bots, trolls, and cyborg users (Shu et al., 2017). Since the cost to create social media accounts is very low, the creation of malicious accounts is not discouraged. If a social media account is being controlled by a computer algorithm, then it is referred to as a social bot. A social bot can automatically generate content and even interact with social media users. Social bots may or may not always be harmful but it entirely depends on how they are programmed. If a social bot is designed with the sole purpose of causing harm, such as spreading fake news in social media, then they can be very malicious entities and contribute greatly to the creation of fake news. For example, “studies shows that social bots distorted the 2016 US presidential election discussions on a large scale, and around 19 million bot accounts tweeted in support of either Trump or Clinton in the week leading up to the election day,” which demonstrates how influential social bots can be on social media (Shu et al., 2017).

However, fake humans are not the only contributors to the dissemination of false information; real humans are very much active in the domain of fake news. As implied, trolls are real humans who “aim to disrupt online communities” in hopes of provoking social media users into an emotional response (Shu et al., 2017). For instance, there has been evidence that claims “1,000 Russian trolls were paid to spread fake news on Hilary Clinton,” which reveals how actual people are performing information manipulation in order to change the views of others (Shu et al., 2017). The main goal of trolling is to resurface any negative feelings harvested in social media users, such as fear and even anger, so that users will develop strong emotions of doubt and

distrust (Shu et al., 2017). When a user has doubt and distrust in their mind, they won't know what to believe and may start doubting the truth and believing the lies instead.

While contributors of fake news can be either real or fake, what happens when it's a blend of both? Cyborg users are a combination of "automated activities with human input" (Shu et al., 2017). The accounts are typically registered by real humans as a cover, but use programs to perform activities in social media. What makes cyborg users even more powerful is that they are able to switch the "functionalities between human and bot," which gives them a great opportunity to spread false information (Shu et al., 2017).

Now that we know some of the reasons why and how fake news progresses, it would be beneficial to discuss the methods of detecting online deception in word-based format, such as e-mails. The two main categories for detecting false information are the Linguistic Cue and Network Analysis approaches.

Linguistic cue methods

In Linguistic Cue approaches, researchers detect deception through the study of different communicative behaviors. Researchers believe that liars and truth-tellers have different ways of speaking. In text-based communication, deceivers tend to have a total word count greater than that of a truth-teller. Also, liars tend to use fewer self-oriented pronouns than other-oriented pronouns, along with using more sensory-based words. Hence, these properties found in the content of a message can serve as linguistic cues that can detect deception (Rubin, 2017). Essentially, Linguistic Cue approaches detect fake news by catching the information manipulators in the writing style of the news content. The main methods that have been implemented under the Linguistic Cue approaches are Data Representation, Deep Syntax, Semantic Analysis, and Sentiment Analysis.

When dealing with the Data Representation approach, each word is a single significant unit and the individual words are analyzed to reveal linguistic cues of deception, such as parts of speech or location-based words (Conroy, Rubin, & Chen, 2015).

The Deep Syntax method is implemented through Probability Context Free Grammars (PCFG). Basically, the sentences are being transformed to a set of rewritten rules in order to describe the syntax structure (Conroy, Rubin, & Chen, 2015).

Another approach, Semantic Analysis, determines the truthfulness of authors by characterizing the degree of compatibility of a personal experience. The assumption is that since the deceptive writer has no previous experience with the particular event or object, then they may end up including contradictions or maybe

even leave out important facts that were existent in profiles on related topics (Conroy, Rubin, & Chen, 2015).

Finally, the last linguistic approach, Sentiment Analysis, focuses on opinion mining, which involves scrutinizing written texts for people's attitudes, sentiments, and evaluations with analytical techniques. However, this approach still is not perfect considering that the issues of credibility and verification are addressed with less priority (Rubin, 2017).

Network analysis methods

In contrast, Network Analysis approaches are content-based approaches that rely on deceptive language cues to predict deception. What makes this category different from the Linguistic approach is that the Network Analysis approach needs "an existing body of collective human knowledge to assess the truth of new statements" (Conroy, Rubin, & Chen, 2015). This is the most straightforward way of false information detection by checking the "truthfulness of major claims in a news articles" in order to determine "the news veracity" (Shu et al., 2017). This approach is fundamental for further progress and development of fact-checking methods. The underlying goal is using outside sources in order to fact-check any projected statements in news content by assigning a "truth value to a claim in a particular context" (Shu et al., 2017).

Moreover, the three existing fact-checking methods are expert-oriented, crowdsourcing-oriented, and computational-oriented. Expert-oriented fact checking is intellectually demanding and even time consuming since it is heavily based on human experts to analyze "relevant data and documents" which will lead to them composing their "verdicts of claim veracity" (Shu et al., 2017). A great example of expert-oriented fact checking is PolitiFact. Essentially PolitiFact requires their researchers to spend time analyzing certain claims by seeking out any credible information. When enough evidence has been gathered, a truth-value that ranges from True, Mostly True, Half True, Mostly False, False, and Pants on Fire is assigned to the original claim.

In addition, crowdsourcing-oriented fact checking uses the "wisdom of the crowd" concept which allows normal people, instead of only experts, to discuss and analyze the news content by using annotations which are then used to create an "overall assessment of the news veracity" (Shu et al., 2017). An example of this in action is Fiskkit, which is an online commenting website that aims to improve the dialogue of online articles by allowing its users to identify inaccurate facts or any negative behavior. This enables users to discuss and comment on the truthfulness of certain parts and sections of a news article (Shu et al., 2017).

Finally, the last type of fact-checking is Computational-oriented, which provides “an automatic scalable system to classify true and false claims” and tries to solve the two biggest problems: i). Identifying any “claims that are check-worthy” and ii). Determining the validity of these fact claims (Shu et al., 2017). Any statements in the content that reveal core statements and viewpoints are removed. These are identified as factual claims that need to be verified, hence enables the fact-checking process. Fact checking for specific claims requires external resources such as open web and knowledge graphs. Open web sources are used as “references that can be compared with given claims in terms of both consistency and frequency” (Shu et al., 2017). Knowledge graphs instead are “integrated from the linked open data as a structural network topology” which aspire to find out if the statements in the news content can be deduced from “existing facts in the knowledge graph” (Shu et al., 2017).

Moreover, the two main methods that are being used under the Network Analysis approach are Linked Data and Social Network behavior. In the Linked data approach, the false statements being analyzed can be extracted and examined alongside accurate statements known to the world (Conroy, Rubin, & Chen, 2015). When referring to accurate statements “known to the world” this relates to facts proven to be true and or statements that are widely accepted, such as “Earth is the name of the planet we live in.”

Relating to the Social Network Behavior approach, this uses centering resonance analysis, which can be abbreviated as CRA, in order to represent “the content of large sets of text by identifying the most important words that link other words in the network” (Conroy, Rubin, & Chen, 2015). All the previous approaches discussed are the main methods of how researchers have been detecting fake news, however these practices have primarily been used for the textual formats, such as e-mails or conference call records (Rubin, 2017). The real question is how do predicative cues of deception in micro-blogs, such as Twitter and Facebook, differ from those of textual formats?

Therefore, concerning the area of false information in social media, fake news in the field of social media is relatively new. There have only been a handful of research studies completed in this domain, which requires more research to be conducted. In order to address this area, researchers are currently working on creating software that has the ability to detect deception. Deception detection software generally implements the different types of Linguistic cue approaches. However, when dealing with false information detection on social media, the problem is much more complex, using one method is no longer enough. Since linguistic cues are only one part of the problem, there are other aspects that essentially need to be incorporated such as positioning

of the message sources in the network, reputation of cites, trustworthiness, credibility, expertise, and the tendency of spreading rumors should all be considered (Rubin, 2017).

Selected methods explored further

Furthermore, the methods to be further explored in relation to fake news detection in social media are Naïve Bayes classifier, SVM, and semantic analysis.

Naïve Bayes Classifier

Naïve Bayes is derived from Bayes Theorem, which is used for calculating conditional probability, the “probability that something will happen, given that something else has already occurred” (Saxena, 2017). Thus we are able to compute the likelihood of a certain outcome by using past knowledge of it.

Furthermore, Naïve Bayes is a type of classifier considered to be a supervised learning algorithm, which belongs to the Machine Language class and works by predicting “membership probabilities” for each individual class, for instance, the likelihood that the given evidence, or record, belongs to a certain class (Saxena, 2017). The class with the greatest, or highest probability, shall be determined the “most likely class,” which is also known as Maximum A Posteriori (MAP) (Saxena, 2017).

Another way of thinking about Naïve Bayes classifier is that this method uses the “naïve” notion that all features are unrelated. In most cases, this assumption of independence is outrageously false. Suppose Naïve Bayes classifier is scanning an article and comes across “Barack,” in many cases the same article will also have “Obama” contained in it. Even though these two features are clearly dependent, the method will still calculate the probabilities “as if they were independent,” which does end up overestimating “the probability that an article belongs to a certain class” (Fan, 2017). Since Naïve Bayes classifier overestimates the probabilities of dependencies, it gives the impression that it would not work well for text classification. On the contrary, Naïve Bayes classifier still has a high performance rate even with “strong feature dependencies,” since the dependencies will actually end up cancelling out each other for the most part (Fan, 2017).

In addition, what makes Naïve Bayes classifier desirable is that it’s relatively fast and a highly accessible technique. It can be used for binary or multiclass classifications, making it an excellent choice for “Text Classification problems” as mentioned earlier (Saxena, 2017). Also, Naïve Bayes classifier is a straightforward algorithm that only really relies on performing many counts. Thus, it can be “easily trained on a small dataset” (Saxena, 2017).

However, the biggest downfall of this method is that it deems all the features to be separate, which may not always be the case. Hence, there is no relationship learned among the features (Saxena, 2017).

SVM

A support vector machine (SVM), which can be used interchangeably with a support vector network (SVN), is also considered to be a supervised learning algorithm. SVMs work by being trained with specific data already organized into two different categories. Hence, the model is constructed after it has already been trained.

Furthermore, the goal of the SVM method is to distinguish which category any new data falls under, in addition, it must also maximize the margin between the two classes (Brambrick). The optimal goal is that the SVM will find a hyperplane that divides the dataset into two groups.

To elaborate further, the support vectors are “the data points nearest to the hyperplane” and if removed would modify the location of the dividing hyperplane (Brambrick). Thus, support vectors are crucial elements of a data set. In addition, the hyperplane can be thought of as “a line that linearly separates and classifies a set of data” and “the further from the hyperplane our data points lie,” the higher the chance that the data points have been accurately classified (Brambrick).

Moreover, the advantages of using the SVM method are that it tends to be very accurate and performs extremely well on datasets that are smaller and more concise. In addition, this technique is very flexible since it can be used to classify or even determine numbers. Also, support vector machines have the capability to handle high dimensional spaces and tend to be memory efficient (Ray, Srivastava, Dar, & Shaikh, 2017).

On the contrary, the disadvantages of using the SVM approach are that it has difficulty with large datasets since “the training time with SVMs can be high” and it is “less effective on noisier [meaningless] datasets with overlapping classes” (Brambrick). In addition, the SVM method will not “directly provide probability estimates” (Ray et al., 2017).

Semantic Analysis

Semantic analysis is derived from the natural language processing (NLP) branch in computer science. As discussed earlier, the method of semantic analysis examines indicators of truthfulness by defining the “degree of compatibility between a personal experience,” as equated to a “content ‘profile’ derived from a collection analogous data” (Conroy, Rubin, & Chen, 2015). The idea is that the fake news author is not familiar with the specific event or object. For example, they have never even visited the location in question, thus they may neglect facts that have been present in “profiles on similar topics” or potentially

include ambiguities that semantic analysis can detect (Conroy, Rubin, & Chen, 2015).

Furthermore, a huge reason for using semantic analysis is that this method is able to precisely classify a document through the use of association and collocation (Unknown, 2013). This is especially useful for languages that have words with multiple meanings and close synonyms, such as the English language. Suppose if one decided to use a simple algorithm that is unable to make the distinction among different word meanings, then the result may be ambiguous and inaccurate. Thus, by considering rules and relations when searching through texts, semantic analysis operates similarly to how the human brain functions (Unknown, 2013).

However, in light of the situation of comparing profiles and the “description of the writer’s personal experience” discussed above, there are potentially two limitations with the semantic analysis method (Conroy, Rubin, & Chen, 2015). In order to even “determine alignment between attributes and descriptors,” there needs to be a great amount of excavated content for profiles in the first place (Conroy, Rubin, & Chen, 2015). In addition, there also exists the challenge of being able to accurately associate “descriptors with extracted attributes” (Conroy, Rubin, & Chen, 2015).

Proposed method

Due to the complexity of fake news detection in social media, it is evident that a feasible method must contain several aspects to accurately tackle the issue. This is why the proposed method is a combination of Naïve Bayes classifier, Support Vector Machines, and semantic analysis. The proposed method is entirely composed of Artificial Intelligence approaches, which is critical to accurately classify between the real and the fake, instead of using algorithms that are unable to mimic cognitive functions. The three-part method is a combination between Machine Learning algorithms that subdivide into supervised learning techniques, and natural language processing methods. Although each of these approaches can be solely used to classify and detect fake news, in order to increase the accuracy and be applicable to the social media domain, they have been combined into an integrated algorithm as a method for fake news detection.

Furthermore, SVM and Naïve Bayes classifier tend to “rival” each other due to the fact they are both supervised learning algorithms that are efficient at classifying data. Both techniques are moderately accurate at categorizing fake news in experiments, which is why this proposed method focuses on combining SVM and Naïve Bayes classifier to get even more accurate results. In “Combining Naive Bayesian and Support Vector Machine for Intrusion Detection

System,” the authors integrate both methods of SVM and Naïve Bayes classifier in order to create a more precise method that classifies better than each method individually. They found that their “hybrid algorithm” effectively minimized “false positives as well as maximize balance detection rates,” and performed slightly better than SVM and Naïve Bayes classifier did individually (Sagale, & Kale, 2014). Even though this experiment was applied to Intrusion Detection Systems (IDS), it clearly demonstrates that merging the two methods would be relevant to fake news detection.

Moreover, introducing semantic analysis to SVM and Naïve Bayes classifier can improve the algorithm even more. The biggest drawback of Naïve Bayes classifier is that it deems all features of a document, or whichever textual format being used, to be independent even though most of the time that is not the situation. This is a problem due to lowered accuracy and the fact that relationships are not being learned if everything is assumed to be unrelated. As we mentioned earlier, one of the biggest advantages of semantic analysis is that this method is able to find relationships among words. Thus, adding semantic analysis helps fix one of the biggest weaknesses of Naïve Bayes classifier.

In addition, adding semantic analysis to SVM can improve the performance of the classifier. In “Support Vector Machines for Text Categorization Based on

Latent Semantic Indexing,” the author shows that combining the two methods improves the efficiency due to “focusing attention of Support Vector Machines onto informative subspaces of the feature spaces,” (Huang, 2001). In the experiment, semantic analysis was able to capture the “underlying content of document in semantic sense,” (Huang, 2001). This improved the efficiency of SVM since the method would waste less of its time classifying meaningless data and spend more time organizing relevant data with the help of semantic analysis. As outlined earlier, a huge benefit of semantic analysis is its ability to extract important data through relationships between words; hence, semantic analysis is able to use its fundamental benefit to further improve SVM.

Conclusion

As mentioned earlier, the concept of deception detection in social media is particularly new and there is ongoing research in hopes that scholars can find more accurate ways to detect false information in this booming, fake-news-infested domain. For this reason, this research may be used to help other researchers discover which combination of methods should be used in order to accurately detect fake news in social media. The proposed method described in this paper is an idea for a more accurate fake news detection algorithm. In

the future, I wish to test out the proposed method of Naïve Bayes classifier, SVM, and semantic analysis, but, due to limited knowledge and time, this will be a project for the future.

It is important that we have some mechanism for detecting fake news, or at the very least, an awareness that not everything we read on social media may be true, so we always need to be thinking critically. This way we can help people make more informed decisions and they will not be fooled into thinking what others want to manipulate them into believing.

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Data-informed, agent-based model of information dissemination within social media networks

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Abstract

Online social media are becoming increasingly prevalent sources for both legitimate and fake news. Therefore, there is a growing need to study the way in which information spreads across social media and how this spread of information influences the opinions and decision making of social media users. Prior studies have used a variety of models from linear threshold to epidemic models for studying information diffusion in social networks. The present study hypothesizes that an agent-based model can be developed that is informed by data extracted from real world social media platforms. The model for this research has been developed using the NetLogo agent-based modeling framework. Real-world data extracted from Twitter using the Twitter Streaming API and the Twython library informs the structure of the model. The model has face validity in that it performs in manners expected from observing social media platforms. This provides justification for further study of the model involving more detailed statistical analysis to measure fit with data from real world social media platforms.

Keywords: social media, fake news, information dissemination

Introduction

Due to the ubiquitous use of smartphones and other mobile electronic devices, online social media are emerging sources for news of both legitimate and illegitimate variety. The ease of access, the utilization of consumers as information disseminators and the declining presence of traditional news media are all factors that contribute to a conceivable era in which social media are not only the dominant form of news media outlets, but the only form. The need for user interaction to spread information across social media through actions such as directly sharing posts, commenting on posts, or liking posts creates a multitude of factors that may affect the speed and scope of information diffusion. The result of this array of potentially important factors has been an increasingly large number of studies conducted utilizing a large assortment of models. Chief classifications of dissemination models include linear threshold models, game theory models, and epidemic models (Wang, Zhang, Guo, & Qiao, 2016).

The most popular of these models has been epidemic models due to the similarities between the spread of information and the spread of infectious disease (Wang, Zhang, Guo, & Qiao, 2016). Among epidemic models, there are three major types: SI models, SIR models and SIS models. Of the three types, the SIR

model is considered optimal and it is the most widely used. This is due to its having three stages: Susceptible, which is a node that can become infected; Infected, that is a node that the disease has already infected; and Removed, which is a node that is unable to be infected either due to immunization or recovery (Wang, et al., 2016). This allows for a representation of users that are unwilling to share information which is one of the many factors that changes how information disseminates.

A recent study used the SIR model and adjusted the base model to allow for shifts of interest level by the



Figure 1. SIR base

user from interested to uninterested within a modular network. A modular network allows exploration of the community structure of social networks. Social media networks tend to have many connections within a community, but fewer that connect separate communities. The study found that both the modularity of social media networks and the interest-changing behavior of the users significantly affect the speed and size of an information outbreak (Zhao & Cui, 2017).

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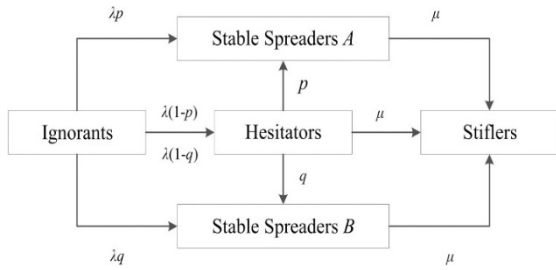


Figure 2. SHIR model (Liu, Diao, Zhu, & Liu, 2016)

Another study used a slightly modified SHIR model, Susceptible-Hesitated-Infected-Removed, and explored the effects of competing information. Within this model, both the Susceptible and the Hesitated users can become infected. However, the Hesitated users are not stable spreaders of one of the information types or another, while the two infected groups of users are stable spreaders of information A or information B. This means that the hesitated groups can stop spreading one information in favor of the other depending on the status of their connected users. In this way, the model accounts for those users that tend to change their attitude toward information based on the actions of their peer group (Liu, Diao, Zhu, & Liu, 2016). Figure 2 demonstrates the added complexity of the SHIR model over the base SIR model.

Recent research into microblog information dissemination shows that few studies exist that account for differences between the epidemic spread of disease and the dissemination of information. Therefore, the

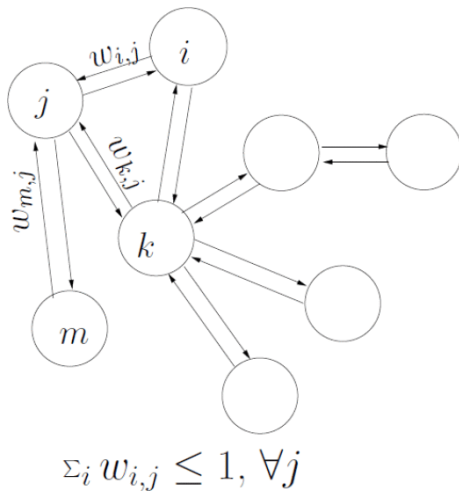


Figure 3. Linear threshold model (Venkatramanan & Kumar, 2011)

authors developed an optimized SIR model that accounted for activity level, dissemination rate,

immunization rate, and credibility. Their results showed differences between epidemic disease spread and information diffusion. In addition, their model proved to be a good fit for empirical data on information diffusion. However, they found that their model did not accurately account for activity level (Wang, et al., 2016).

Other models have issues related to scalability rather than from flexibility. A study on a linear threshold model of information dissemination (Figure 3) found that edge weights and time-variable threshold functions could represent influence levels of nodes within a social network with simple topology (Venkatramanan & Kumar, 2011). However, the study did not explore beyond these simple topologies. Therefore, the scalability of the model was not determined. Using a game theory model (Figure 4), another study could simulate retweeting behavior of the Sina Weibo social network. However, the model was only reflective of the actual behavior of the social network when the number of users was below 6000 (Wang & Cai, 2015). As with the linear threshold model, there are issues within game theory of scalability.

Each of these studies demonstrates that while the basic SIR-epidemic model, linear threshold model and game theory model are good representations of information dissemination, there are a multitude of factors, including shifts of user interest, user activity level, dissemination rate, immunization rate, credibility of sources and competing information, for which these base models do not account. Due to the substantial number of factors for which these must account when applied to information diffusion, the models necessarily become increasingly complex. The large number of potential factors in information diffusion suggests that models allowing more flexibility than that seen in

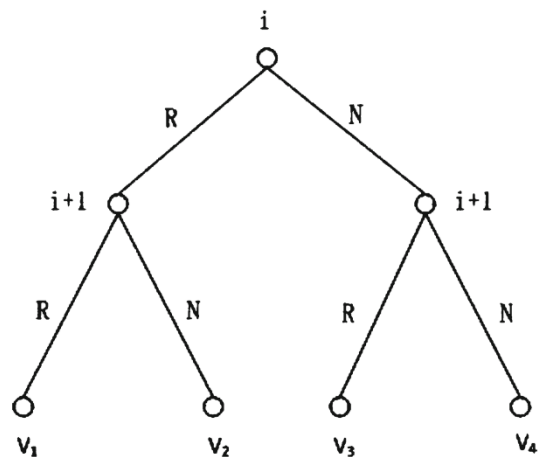


Figure 4. Game theory model (Wang & Cai, 2015).

epidemic models might be a better fit. Additionally, the flexibility of agent-based models has allowed their use

to study opinion dynamics (Banisch, Lima, & Araújo, 2012).

Researchers have applied implementations of both the Bass model and the independent cascade model translated into agent-based models to the study of urgent information diffusion over social media networks. The paper examined four events for this research: Hurricane Sandy, Hurricane Irene, the capture of Osama bin Laden, and the 2012 United States Presidential Election. The study found that for hurricane events, the models fit well with data pulled from Twitter data collection APIs (Twitter, Inc., 2014). However, the models did not fit as well to data pulled for the capture of Osama bin Laden nor for the Presidential Election (Rand, Herrmann, Schein, & Vodopivec, 2015).

The present research aims to construct an agent-based model, using input data extracted directly from Twitter's social media platform, that can account for the substantial number of factors within information diffusion in social media networks, allows the tracking of opinion dynamics, and fits with empirical observations of information dissemination within those networks. This model will have a method for observing how information dissemination influences agent behavior such as holding beliefs on issues. After developing and validating the model, the researcher will explore what insights can be inferred from the model about the effects of information spread on the agents' opinions.

Methods

Overview. This research has developed a model within the agent-based modelling environment, NetLogo. The model can account for a variety of factors that influence information dissemination such as competing information, differences in user network activity behaviors, and length of time that the user has held their position on a specific issue. This study extracts data from Twitter using the Twython Python Library (McGrath, 2014) and the Twitter Data Streaming API (Twitter, Inc., 2014). This data serves as the input information for construction of the agent-based model.

Data Extraction and Input. The data extraction code uses the Twython library to query a random Twitter user. It then pulls the user's follower list and iterates through each of the user's followers to pull their follower lists. These data are used to form an adjacency matrix of the user connections. Upon conversion into the adjacency matrix, the original user IDs and screen names used for building the adjacency matrix are deleted to ensure the privacy of the users' data. This adjacency matrix data is then input into the NetLogo program to inform the structure of the agent-based model.

Agent-based Model. The model is based upon the basic SIR epidemic model with the states: Susceptible,

Infected, Recovered. The three states of the SIR model are represented by only two agent-states: uninformed and informed. Initially, each agent that is in an uninformed state is representative of the susceptible state. Agents which have received the spreading information enter the informed state which is analogous with infected. Finally, after a period of time, the agent enters the "recovered" state which in this model is represented by a return to the susceptible state.

The model has mechanisms for controlling the following factors:

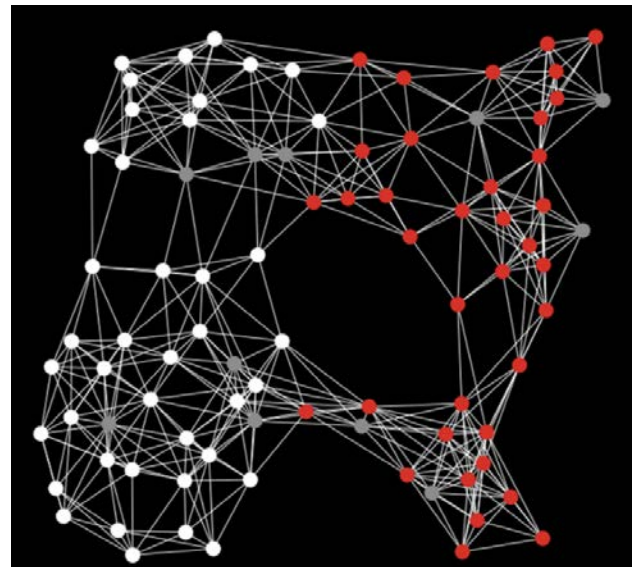


Figure 5. Agent-based model within NetLogo (Wilensky, 1999)

- The total number of agents within the network.
- The degree of nodes within the network.
- The number of initially informed agents.
- The chance for agents to share information.
- Whether agents recover from the informed state and the time it takes to do so.
- Whether there is a single type of information or competing information types.

The agents that have received the information have the behavior of passing information to all their connected agents, in much the same way that someone would post to a social media network and it would go out to all their followers. The probability of passing information to connections depend on the opinion of the agent. The opinion of agents can switch to that of received information with a probability dependent on the number of timesteps the agent's current opinion has been held and the number of times the agent has heard information supporting changing the opinion.

Now that the basic model has been established, additional complexity allowing for multiple competing

information and dynamic release of information while the model is running will be added to allow for a more realistic fit of how information is released into social media networks. In all cases of increased complexity, the model allows for deactivation or control of factors that contribute to the dissemination of information or opinion dynamics. This allows the influence of isolated factors to be studied.

Results

The model shows face validity. It successfully pulls in data extracted from Twitter and behaves qualitatively in a manner as expected of a social media network. The network is constructed using the parameters from the data and NetLogo is able to run the model indefinitely. Both via the manually adjustable controls and the input via Twitter show that the model has potential for scalability with the model being able to successfully run on a laptop computer with 50000 agents in the model.

The model also shows potential for running experiments. The NetLogo framework has a built-in tool, called BehaviorSpace, for running experiments. BehaviorSpace is flexible as it allows fine control over any of the parameters within the model. It is also capable of running iterations with several stages of the same variable or multiple variables. In a preliminary experiment, the average number of nodes was incremented during each run of 1000 iterations beginning at 10 nodes and scaling up to 25 nodes. This allowed isolation of how the model behaves when a single variable is manipulated.

Implications

This research has the goal to provide a new model for studying the dissemination of information that uses extracted Twitter data to construct the network within the model. Due to the face validity of the agent-based model, it shows potential as a valuable tool for the further study of information dissemination. This provides justification for developing further studies that will allow statistical analysis to determine the fit of the model against real world data from Twitter. If statistical analysis shows that the model fits, then it will be a valuable tool in studying how information spreads over social media platforms and the impact that has on users' opinion dynamics and decision-making processes.

Future work

There are many potential works that could develop out of this study. Next steps in this line of inquiry would first include the above mentioned statistical analysis and validation of the model. Additionally, there is the possibility of exploring other potential sources of social network data. This would expand the utility of the model by allowing it to be used with various social media network topographies. Finally, it should be possible to use data from sentimentality studies on social media to develop a method of data-driven model behavior in similar fashion to that used for the model construction. Each of these potential future studies would expand the capabilities and, thus, the value of this agent-based model as an academic tool.

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Relationship between airborne proteins in the Central Valley area and allergies

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Abstract

Here in the Central Valley there are many contributions to ambient particulate matter. Agriculture, ranching activities, fires, wind-blown dust, diesel and gasoline exhaust, power plant emissions, and home heating all play a role in the particulate matter that is present in our environment. The Central Valley of California has many individuals who face allergic reactions, which may be epidemic or respiratory reactions. Agriculture, ranching activities, fires, wind-blown dust, diesel and gasoline engine exhaust are all activities that are very highly needed and take place here in the Central Valley. Sacramento was listed in the Huffington post as one of the worst US cities for allergies and that is because of the high particle concentration. Identifying mass concentration of what is obtained from our environment should shed light on what is being breathed in by the general population who reside in the Central Valley.

Keywords: allergen, proteins, particle concentration, asthma

Introduction

Air quality in the Central Valley is among the worst in the United States, causing allergies and potential long-term medical conditions. Woodfolk, J. et al (2015) reports how allergens are proteins or glycoproteins that evoke an immunoglobulin E antibody response. These molecules travel through the air on aerosol particles present in dust. Smith, et al. (2003) also suggests that such allergens and particles may be retained in the lungs and actually result in structural alterations over time.

Another study, focused on a different way airborne particles affect individuals: bakery and mill workers. Baker's asthma is caused by the flour allergens that are present in their work environment (Sandiford, C. et al , 1994). Now we have to take into consideration that these individuals are exposed to these flour allergen because they are abundant in their work environment. What about the rest of the population: individuals who work outdoors or even children who enjoy playing outside. Nordling et.al (2008) focused on this topic, the correlation between air pollution from traffic and the effect it has on children who were exposed to this environment in their first year of life. Through questionnaires, blood samples, and peak expiratory flow measurements, it was proposed that air pollution may increase the sensitivity of the airway epithelium to airborne allergens. Diesel exhaust particles may induce immunoglobulin E responses directly by acting on B cells and enhancing the production of cytokines that

favor the development of an allergy-prone immune response (Nordling et.al, 2008). Hostetler, et. al focused on the evidence for pathogenesis laboratory testing, clinical presentation, and treatment options for patients with airborne proteins acting as a contributing factor to atopic dermatitis (AD). In this study the history of AD exacerbations after exposure to airborne proteins was tracked to analyze if there was a correlation with the environment and their condition being exacerbated.

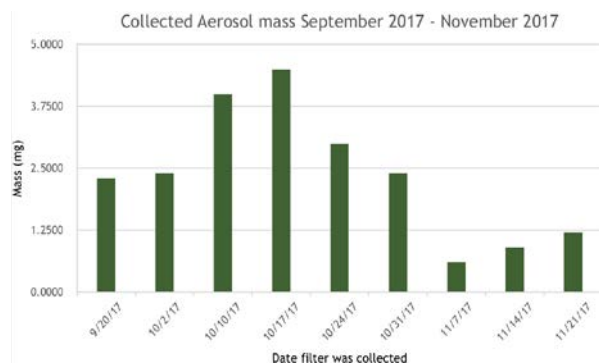
Although we know that particulate matter is involved in adverse health effects, the physical or chemical properties responsible remain unknown (Smith et. al 2003). In a study performed by Smith et. al (2008) in Fresno California, male Sprague-Dawley rats were exposed to concentrated aerosol chambers to determine if concentrated fine/ultra-fine fractions of ambient PM 2.5 are cytotoxic and/or pro-inflammatory in the lungs of healthy adult rats. This study showed consistent cytotoxic and inflammatory responses associated with exposure to concentrated air particles.

Results and current findings:

Currently, findings include higher aerosol mass obtained in mid-October, and lower aerosol mass obtained in November (see graph below). According to Jennifer Chu from MIT News Office, as a raindrop falls through the atmosphere, it can attract hundreds of aerosol particles. According to Steffen Thorse at timeanddate.com, the average temperature and humidity

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in Turlock in October 2017 was 64°F and 54% respectively and the average temperature and humidity



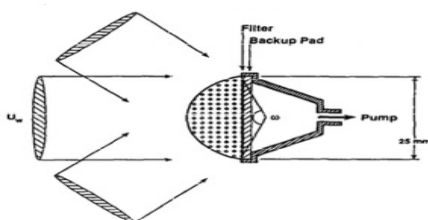
in November was 56°F and 78% respectively. Through this we can see that there is a correlation between high humidity and decreased mass on the filter paper. After analyzing the data obtained, the mass of protein present in the filter paper was also calculated (see table below).

Date collected:	mass of filter paper (mg)	Protein mass in sample (mg)	Mass protein in sample (%)
9/20/17	2.3000	0.23107	1.0%
10/2/17	2.4000	0.58195	2.4%
10/10/17	4.0000	0.79734	2.0%
10/17/17	4.5000	0.87625	1.9%
10/24/17	3.0000	0.43049	1.4%
10/31/17	2.4000	0.75220	3.1%
11/7/17	0.6000	0.05845	1.0%
11/14/17	0.9000	0.25735	2.9%
11/21/17	1.2000	0.46817	3.9%

In mid-October (10/17/2017), when we collected the greatest mass in the filter paper, 0.87625 mg of the mass was protein. In the beginning of November, when there was the least mass collected in the filter paper, 0.05845 mg of the mass was protein. Through this data, we can conclude that indeed there are proteins present in our environment. The specific proteins present here in the Central Valley were not identified through this experiment.

Methods:

Dust samples were collected from the San Joaquin Valley on a weekly basis (for the purpose of this research article, data gathering began September 2017 and ended in November 2017). A multi-directional aerosol sampler pump (see figure below) was located on



the rooftop of the Naraghi Hall of Science building at California State University, Stanislaus, in Turlock, CA. The pump ran for 7 days at 2L/min. Filters were collected from the aerosol sampler after 7 days and laboratory work was performed to the filter and its content. The mass of filter paper, pre-collecting and post-collecting, was obtained. The aerosol filter with the sample was then submerged in Tris-glycine x10 buffer solution and then sonicated for 1 hour. Sonication is the act of applying sound energy to disturb/break down particles in a sample. For the purpose of this experiment, sonication was used to break down the content of our sample. After the 1 hour period, the solution was centrifuged. The separation in the solution allows us to do further analysis. Note: A clean filter paper is used as a control and was subject to the same procedure.

Protein Assay was performed in our sample and control filters. Both sample and control filters were to be left in the sonicator for 15 minutes before proceeding to the next step. While both the sample and control were in the centrifuge, protein concentration standard of Bovine Serum Albumin were being diluted. 4 standard dilutions were to be made:

- 1) 500µL of the Bovine Serum Albumin standard were to be transferred to microcentrifuge tube #1
- 2) 200µL from microcentrifuge tube #1 were transferred to microcentrifuge tube #2 and 200µL of water was added.
- 3) 200µL of microcentrifuge tube #2 were transferred to microcentrifuge tube #3 which also had 200 µL of water added to it.
- 4) 200µL of the microcentrifuge tube #3 were transferred over to microcentrifuge tube #4, 200µL of water were also added.

Once the Bovine Serum Standard dilutions were made, 100µL of each standard dilution was transferred to a new test tube where reagents were added. 500µL of Reagent A' And 4 mL of Reagent B were added to each test tube. Note: Reagents come in the Bio-Rad DC Protein Assay Kit, calculations were performed to identify the necessary amount of each reagent that was needed to be added to the test tubes. Kit includes Reagent A, an alkaline copper tartrate solution, reagent B, a dilute Folin reagent, and Reagent S, a surfactant solution.

After the 15 minutes elapsed, the sample and control were done being centrifuged. 100µL of each (the sample and control) were aliquoted and added to a new test tube. The same reagents that were added to the standards are to be added to the sample and the control.

The standards, the sample, and control were analyzed with the software program called UV-Vis (Ultraviolet-visible spectroscopy). UV-Vis helped us quantify the concentration of aerosol proteins that were obtained from the filter paper by allowing us to compare it to the absorption of the standard BSA dilutions.

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Isometrically pure, mono-bromination of an organic compound

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Abstract

Acetaminophen, or more commonly known, "Tylenol," has a chemical structure that is nearly identical to that of Methamphetamine, commonly known as "Meth", with the exception of an additional CH₃ group connected to the Nitrogen in Meth. It is important to note that the change around even a single bond can have a dramatic effect on the overall reactivity of the molecule. Acetaminophen is used clinically as an analgesic, whereas Meth is used as an illegal drug due to its dangerous, potent, and addictive properties. Meth and Tylenol are only two specific examples; however, almost all drugs made and distributed throughout the world are manufactured inside a chemical laboratory. Organic synthesis is the regeneration of naturally occurring compounds through manipulation of previously tested procedures. Intricate properties such as exact placement of atoms in a chemical structure in addition to its reactivity with the reactants/catalysts are analysed on the molecular level. It is the analysis of such characteristics that allows big-name corporations to produce the drugs that are distributed worldwide. This research explores the monobromination and regio-selectivity of the bromine to a specific organic compound, Anisole.

Keywords: bromination, organic chemistry, organic synthesis

Introduction

Organic chemistry focuses on the reactions between molecules that contain the single most important element found in every living organism, the carbon atom. Although we are not always aware of carbon's various functions, these seemingly trivial atoms lay out a specific design that defines the uniqueness of a human being. There are innumerable reactions occurring with just a single carbon atom every second of our everyday lives and many of those reactions are still only partially understood. Organic chemistry directly explores reactions occurring with carbon, but, in essence, has the underlying purpose of understanding life. Chemists understand life by evaluating naturally occurring organic compounds, and when they wish to study human life, specific compounds that make up the human system are analyzed.

An important aspect of organic chemistry is organic synthesis, which refers to the regeneration of naturally occurring compounds through the use of organic chemicals inside a laboratory. As reported by Org Syntheses, a non-profit organic synthesis corporation, it is the manipulations of previously experimented procedures that trigger generations of new compounds while other manipulated experiments demonstrate general utility of known compounds. Synthesis typically involves several individual reactions resulting in a

sequence of available starting materials to desired end products. This is done through the process of the breaking of existing bonds and the formation of new ones. It is important to note that each step of the reaction usually involves altering only one chemical bond in the molecule at a time.

With the ability to generate or alter the bonds of various molecules that define life, organic synthesis facilitates advancements in biology through its applications in drug synthesis for medicinal therapy.

Background

Organic chemists analyze previously experimented reactions to propose refined mechanisms for the synthesis of new organic compounds. An important, and very common reaction frequently explored in organic synthesis is referred to as Halogenation.

David Klein, who is an established author of an Organic Chemistry textbook, describes halogenation as a reaction between a halogen and another compound thus resulting in a final product of the specific halogen bound to that compound.

Halogens are non-metallic chemical elements found on Column 17 of the periodic table. These elements include fluorine (F), chlorine (Cl), bromine (Br), iodine (I), astatine (At), and tennessine (Ts), most of which are commonly studied due to their highly reactive characteristics. The halogens greatly resemble

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one another in their general chemical properties as well as in their behavior when reacting with other elements. Therefore, knowledge of the chemical behavior of one halogen will guide our understanding of various other halogens.

A specific halogenation reaction, bromination, as implied by its name, involves the addition of Bromine to a specific compound. The article, "Bromination from the Macroscopic Level to the Tracer Radiochemical Level" from the journal of US National Library of Medicine (NIH), reports that bromination reactions are of growing interest based on the fact that many of its chemical properties have not been explored. Bromide, which is the common form of bromine in a reaction, is a compound composed of 2 bromine atoms bound together. The use of bromide requires harsher conditions because it is more difficult to react. However, when compared to other halogens, brominating agents are far more efficient in halogenation because of their ability to form stronger bonds. This characteristic associated with bromine takes precedence over its cost of harsh conditions.

In the process of bromination, similar to any other organic reaction, chemists evaluate how different molecules interact with one another in a given set of conditions. When reacting molecules, it is very important to consider the component atoms of specific molecules and, even more so, the specific location at which those components bind to the overall molecule. Various terms may be used to describe certain molecules based on the number of specific atoms attached. For example, if only one bromine atom attaches to a certain molecule, the compound is referred to as monobrominated. Or, if two bromine atoms are attached, then the compound is referred to as dibrominated. In further explaining the specificity of chemical substances, Klein defines isomers as molecules that have the same molecular formula but differ in the placement of their atoms. An isometrically pure compound consists of a single isomer, such that it may have the same molecular formula as another molecule, but differs in that each component atom is connected at the exact same position in every single molecule of the sample. This phenomenon is known as regioselectivity. (Klein 3) A molecule that bonds closest to the largest chemical group on an aromatic¹ compound is referred to as the Ortho isomer. If the molecule being added bonds across from the largest chemical group on the aromatic compound is known as the Para isomer and is energetically more favored than the Ortho isomer. A simple change in the position of a single atom in a

molecule completely alters its reactivity, thus the reason its specificity is especially exaggerated. (Klein 4)

Brominating agents and bromination protocols are being experimented in response to the need for isometrically pure brominated organic compounds. The recognition of an efficient mechanism for creating such compounds provides organic chemists the ability to explore its applications in synthesizing new drugs, and therefore advancing in medicine.

In the process of carrying out bromination reactions, the bromine is reacted with simple organic compounds, which are made up of mostly carbon and hydrogen atoms. A specific example that is used in this reaction includes the compound Anisole, which has the molecular formula C₇H₈O. Simple hydro compounds are used because they generally do not have impressive effects on different chemicals, thus limiting outside variables.

Thesis

In an attempt to contribute to advancements in medicine, specifically drug synthesis, the regioselective, mono-bromination of Anisole will be experimented. I propose that an efficient mechanism for achieving an isometrically pure compound of monobrominated anisole, involves reacting molecules of anisole with bromine using a Zinc/Iodine catalyst², in the presence of acetic acid³. This will show that monobromination, which is facilitated by the presence of acetic acid, will be produced by the addition of a Zinc/Iodine catalyst. After determining monobrominated products, regioselectivity between the Ortho and Para positions will be analyzed.

Significance

The discovery and development of new drugs is an intricate, time-consuming, and expensive process. There is a high demand for the development of drugs that are safe and suitably targeted molecules for the treatment of growing diseases. Naturally occurring compounds are used to treat many of diseases, but the main issue is that the means of obtaining such molecules from nature is costly and very inefficient. The goal of organic synthesis is to replicate or regenerate a higher supply of naturally occurring compounds in a chemical laboratory at a lower cost. This goal is accomplished through exploration of chemical mechanisms with various, medically important atoms. In addition, by employing sophisticated catalytic reactions and

¹ Aromatic compounds are ring (cyclic) structures that are made of alternating single and double bonds.

² Catalysts are molecules that speed up a chemical reaction. They are added to a solution but do not get used up.

³ Acetic acid used as a solvent for the chemicals.

appropriately designed synthetic processes, chemists can synthesize not only the molecules of nature and their analogues, but also myriad other organic molecules for potential applications in many areas of science, technology and everyday life.

Organic synthesis expands the chemist's ability to explore applications in pharmaceutical advancements such as the synthesis of new drugs. Specifically, brominated organic compounds serve of importance to the growing use of many pesticides, insecticides, and pharmaceutically/medically active molecules. Most importantly bromine is on the growing rise of interests in use of biological drug candidates for clinical improvement. Bromination has been emphasized since the discovery of bromo derivatives through organic synthesis. Other halogens, such as Chlorine and Iodine, have been studied for decades while the explorations with bromine have thus far been ignored due to bromine's highly explosive properties. This is because carbon bonding to bromine has an advantage over other halogens due to the fact that it forms a stronger bond (in comparison to carbon with other halogens) and therefore is less likely to dehalogenate in solution. In addition, an article written by the American Academy of Allergies and Immunology has noted the concern for individuals that have allergies to iodine⁴. Many individuals report they have allergies to iodine/increasing accumulation of iodine in the thyroid and therefore cannot receive the contrast they need for CT scans. It has been discovered that while iodine is the best option for the contrast, bromine does not accumulate in the thyroid, unlike other commonly used halogens such as iodine, and therefore can be useful in such applications. (Zhou et al)

Due to these recent discoveries, which continue to grow, organic chemists have learned to maneuver around the corrosive properties of bromine to gain a broader understanding of how it can react with various other compounds.

Methods/Experiments

The following experiment was performed in the organic chemistry laboratory at Stanislaus State University in the setting of proper safety techniques.

Method for Bromination of Aromatic compound (Anisole) - Trial 1

In a 10ml round bottom flask, 0.5g of Anisole was placed together with a mixture of 2.4mg of Zinc (Zn) and 2.4mg of Iodine (I₂) particles as well as a magnetic stirring bar. The round bottom flask was clamped onto a stirring plate and a rubber stopper was used to close

⁴ Iodine is used in IV contrast, which is a solution of dye given to individuals prior to having a CT scan to make the image more clear.

the system. In a separate vial, 0.25ml of Bromine (Br₂) and 0.63ml of glacial acetic acid was mixed, and this solution was added drop wise to the mixture of Anisole and the Zn/I₂ catalyst using a needle syringe. The reaction was allowed to mix overnight, with no addition of heat.

After allowing the reaction to occur overnight, a TLC plate was analyzed, and the solution was then heated at 80 degrees for 2 hours. Best efforts were made to maintain the temperature of the reaction near 80 degrees. After heating, TLC plate was again analyzed.

The solution to cooled to room temperature and then placed in an ice bath for the addition of NaOH (Sodium hydroxide, ~1.85ml). This was done to neutralize the solution, and perform an extraction. The organic layer was dissolved in Methylene Chloride, which was then evaporated using the Rotor evaporator.

The compound was then analyzed using NMR, GC and Mass Spectrometry.

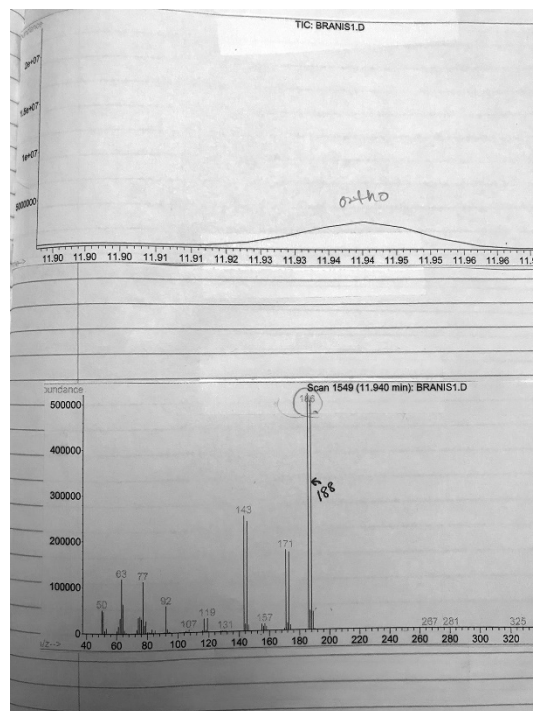
Results

This experiment has revealed that mono-bromination of an aromatic compound; Anisole was carried out in the presence of glacial acetic acid mixed with a Zinc/Iodine catalyst.

Bromination of Anisole- Trial 1

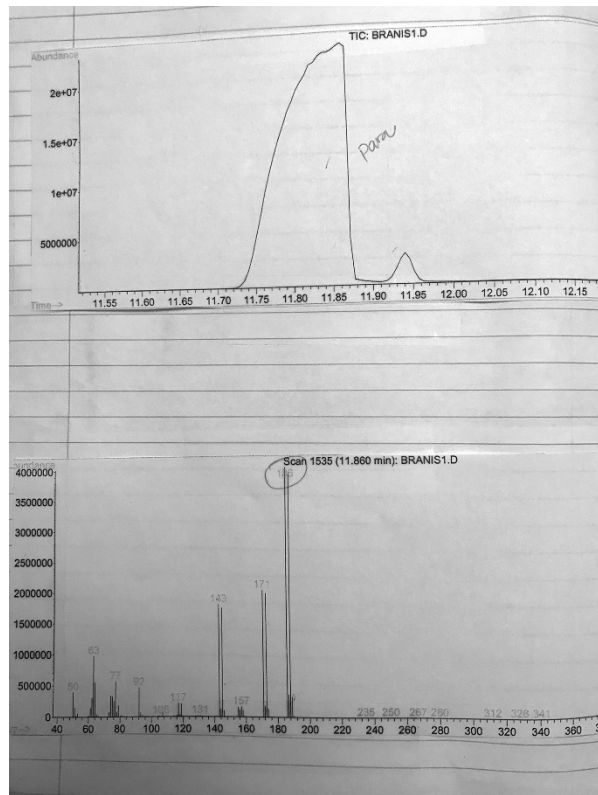
The TLC plates that were analyzed for the reaction that proceeded overnight without heat provided only minimal information because the R_f value of the organic compound was nearly identical to the original

Figure 1. Gas chromatography graph



compound. A few polar segments were identified, but these values were disregarded as starting material. Because the TLC was inconclusive, NMR as well as GC/ Mass Spectrometry was used to further analyze the product.

Figure 2. Gas chromatography graph



Discussion

After performing this reaction in the lab, the solution must be analyzed to determine the composition of the atoms, the structures of the molecules, and the regioselectivity of the atoms to each other in the molecule.

Multiple analyzing techniques were utilized, as noted above. These include thin layer chromatography, nuclear magnetic resonance, and gas chromatography / mass spectrometry

Thin layer chromatography (TLC) is a quick, and easy technique that separates the components of a mixture based on the different affinities of the molecules for the plate. Single drops of the solutions that need to be compared are plotted near the bottom of the TLC plate. The solutions will travel to a certain position in the TLC plate due to their affinities for the molecules in the plates. The length of those distances is measured, known as Rf values and the differences are compared.

Nuclear magnetic resonance (NMR) is a quantitative analysis to determine the content and purity of a sample as well as to discover the basic structure of the molecules. The NMR machine constructs various graphs, which are then analyzed.

Gas chromatography (GC) /Mass Spectrometry (MS) uses gas molecules to separate complex mixtures based on the column.

In figure 1 and figure 2 above, the GC/MS graphs illustrate that mono-bromination was successful, however the solution was not isometrically pure. The graphs indicate the presence of both Ortho and Para isomers. Ortho isomers were less abundant, although they were still present.

In Figure 1, the GC graph illustrates a peak at 11.92 through 11.96. This follows the general patterns studied for the Ortho position and is complimented by the mass spectrometer graph which reveals that the mass of the molecule is 188. This number is important because theoretically, the molecular weight of a mono-brominated anisole compound is 188.

Figure 2 shows a high peak over the range of 11.70-11.90, which follows the general patterns studied for the para position and is also complimented position by the mass spectrometer graph, which reveals the mass of the molecule is also 188.

The bromination of Anisole occurred after running the reaction overnight in the absence of heat, and then for 1 hour in the presence of heat. Because the initial TLC plates were inconclusive and NMR/GC/Mass spectrometry were not analyzed directly after running the reaction overnight in the absence of heat, it is uncertain if the bromination occurred after the first night, or if it occurred only after the addition of heat. This specific reaction will be carried out once again in another trial. In the next trial, the exact same bromination mechanism will be performed without heating overnight. After the first night, I will analyze NMR/GC/MS to see if the catalyst is activated in the absence of heat. This next trial will help in identifying the rate of the reaction without heat, if possible.

I will continue this research by further analyzing the reactivity of another organic compound, Phenol which has similar reactivity characteristics to Anisole. The same reaction will be performed in similar conditions, and the results will be compared to those of Anisole.

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Genetic factors in the Y chromosome related to Autism Spectrum Disorder

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Abstract

Autism Spectrum Disorder (ASD) is one of the fastest growing diagnosed disorders in our time. One in 68 children are diagnosed and the number is even greater in males, with one in 42. There is currently no cure nor definitively known cause for autism. Since it is more prominent in males, there has been speculation that ASD can be attributed to a genetic anomaly, but it has yet to be proven. To test this hypothesis, cheek cell samples were taken from two families. In the first family, the two full brothers sampled have been diagnosed with autism; in the second family two full brothers were sampled, one of whom has been diagnosed with autism. Their DNA samples were compared with that of an adult male who is not diagnosed and has never had anyone in his family diagnosed. None of the participants were twins. Their DNA samples were amplified using polymerase chain reaction (PCR). Once their DNA has been sequenced, we can compare the samples to determine whether there are any genetic differences (such as variations in tandem repeats or single nucleotide polymorphisms) between the children diagnosed with Autism and the males who are not..

Keywords: autism, genetics, Y-chromosome

Introduction

Autism Spectrum Disorder (ASD) is one of the fastest growing diagnosed disorders of our time. It is categorized as a spectrum disorder due to the variability of degree of functionality in ASD patients. Some patients are very high functioning while others do not use their voice to communicate. The symptoms are not always as clear cut as in other disorders. This vagueness has caused biologists and psychologists to question what causes the disorder. Clearly, it affects the patients' behavior, but there is a question of whether it is due to something genetic or an external factor in their environment. My hypothesis is that people with Autism Spectrum Disorder have a genetic anomaly that predisposes them to Autism Spectrum Disorder and something in their environment can trigger it. The question to where they lie on the spectrum depends on the degree of genetic predisposition and the degree of their environmental cues.

A genetic anomaly is best described as an abnormality in a person's genetic sequence that can cause a disease or disorder. Our genetic sequences are the basis of who we are. They code for the genes that we carry. If we have an abnormality in an important gene, such as one that codes for brain function, it can cause detrimental effects. I believe that ASD is caused by a genetic anomaly such as either a single nucleotide

polymorphism (SNP) or a tandem repeat. Nucleotides are the basic components of our DNA. They are either guanine(G), cytosine(C), thymine(T), or adenine(A). Three nucleotides make up a codon; a codon codes for an amino acid. Amino acids make up proteins-macromolecules that serve multiple important functions in our bodies. Genes can be made up of many nucleotides. Some genes are highly conserved and most of the general population has the same nucleotide sequence for the gene, or at least a very similar sequence. If someone has an adenine where the rest of the general population has a thymine, that is called a single nucleotide polymorphism. It is an abnormality of a single nucleotide in a region of a person's genetic sequence. We also have regions of repeating DNA fragments in our DNA. For example, we can have "GCGCGC" repeated multiple times. The number of times that "GC" repeats could vary person to person. In some cases, the more repeats a person has, the more predisposed they are to a certain disorder.

Cystic fibrosis is a disease in which mucus is produced in a much thicker fashion than normal. The mucus builds up in the lungs of the individual. It has many other symptoms and it decreases the quality of life. This is one of many diseases caused by a single nucleotide polymorphism. Huntington's disease is an inherited disorder that causes degenerative break down of nerve cells. It occurs when a person has more than 36

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repeats of the trinucleotide repeat: CAG. The more repeats they have, the more prone they are to having the disease and the earlier it is likely to manifest in life. These are just two examples of diseases that are caused by genetic anomalies.

Autism Spectrum Disorder occurs in one in 68 children and is more prevalent in males, with the rate increasing up to one in 42. Due to the nature of this huge ratio increase, there has been speculation that ASD could be attributed to something in the Y chromosome, since only males have the Y chromosome. If this is the case, people may wonder how it would occur in females at all since they do not possess the Y chromosome. During prophase one of meiosis, crossing over occurs between homologous chromosomes. It is possible though, for an X and Y chromosome to cross over. It does not always occur, but if it did, it could be possible that a Y chromosome with a genetic anomaly could be crossed over with an X chromosome. There could also be a gene on the X chromosome that is fairly similar to a gene on the Y chromosome. This is how a female would get ASD if it is due to the Y chromosome.

A gene on the Y chromosome, NLGN4Y, has been known to play a role in learning, social behavior, and vocalization. Its protein, Neuroligin-4, belongs to a family of cell adhesion molecules that may be critical for functional neuronal synapses. It is found at the Yq11.221 position and is highly expressed in the brain. I previously hypothesized that if a gene was responsible for ASD, it may be possible that it could cross over from the X chromosome, making it probable to show up in females. This gene, however, is not involved in X-Y crossover events. It does have, however, an X-linked counterpart called NLGN4X. NLGN4X is also known as AUTSX2 because of its close association with Autism and Asperger's syndrome. It is also expressed in the brain and affects social behavior, vocalization, and learning. It is believed that its protein plays a role in the formation and reshaping of central nervous system synapses.

Jamain et al (2003) showed a SNP in NLGN3 caused a change from arginine to cysteine in the esterase domain of the protein. This missense mutation was not found in the control group that included 100 females and 100 males. We searched for an arginine to cysteine SNP in the esterase of NLGN4Y and we found one, but it had an extremely low frequency of 0.007%. The SNP with the highest frequency we could find on NLGN4Y caused a frameshift mutation that adds an additional thymine in a region of repeating thymines, causing eight instead of seven. Its frequency was relatively higher at 1.6%.

Polymerase chain reaction, or PCR, is amongst one of the most widely used methods in genetics. It copies a segment of DNA up to the billionth degree so it can be genetically analyzed more efficiently. The first step is

denaturation where the temperature increases to roughly 98 degrees Celsius in order for the double stranded DNA to denature, or unbind from its complimentary strand. The genetic sequence that we wish to copy, or amplify, must be known in order to obtain the correct primers. The primers are a short set of nucleotides that will bind to their complimentary pairs on the DNA sample. This occurs at around 68 degrees Celsius. Adenine binds with thymine and guanine binds with cytosine. The primers attach, or anneal, to the split DNA strands so that DNA polymerase has something to adhere to. There are also free nucleotides in the solution. DNA polymerase adds the complimentary nucleotides in the direction of 5 prime to 3 prime. This elongation phase occurs when the temperature is at 72 degrees Celsius. DNA polymerase will detach when the temperature is increased to the denaturation level again. The cycle repeats multiple times and the DNA copies increase exponentially. In the end we can even end up with billions of DNA sample copies.

Methods and Materials

The Y-chromosome SNP database by Tiirikka and Moilanen (2015) and the National Center for Biotechnology Information helped us narrow down the major genes on the Y chromosome that carried the most probable genetic anomalies.

To obtain the DNA, we took saliva samples that contain cheek cells using a saline mouth rinse. We customized primers to create a 300 base product. The forward primer had 24 bases: 5'-ATGAGAGAACATGGGTTACAAAG-3' and the reverse primer had 21 bases reading: 5'-GTTCCACCCATGAAAGCATC-3'. After isolating the DNA using chelex beads, we conducted the PCR with a variety of alternating factors such as temp and magnesium concentration. We then ran the PCR product through an agarose gel electrophoresis each time, but this showed the PCR to be unsuccessful on multiple attempts. The samples were run through the PCR machine beginning with 30 cycles, and later altered to 32 cycles. Finally, using a different PCR machine that runs multiple reactions with varying temperatures at once, we were able to obtain a successful PCR product between 56 to 58 degrees Celsius for primer binding. The gel was also modified from the initial 0.75 grams of agarose to 0.80 grams, while keeping the buffer at a constant 50 milliliters. The next step is to extract the DNA from the agarose gel to be sent off for sequencing.

The research focused only on males. DNA will be compared from two families: one with a set of brothers who have both been diagnosed with ASD and the other in which only one of the brothers has ASD. In each case, the brothers are fully genetically related and the samples were only taken from them, not the entire family. Their

samples will be compared to that of an unrelated male who does not have ASD and has no family history of ASD. If we can find a genetic anomaly in the two males who have been diagnosed from the males who have not, then that genetic anomaly may be attributed to Autism Spectrum Disorder.

Results

The DNA samples are being sent out with a primer for sequencing, thus, results are pending at this time.

Discussion

We do not yet have the final results, but we hope to find the frameshift mutation in the target segment of DNA from the boys with ASD, and absent in the males who do not have ASD. If all the males with ASD have the extra thymine in the same spot, but the males who do not have ASD do not carry the extra thymine, it will show up in the genetic sequencing of the PCR product. It only takes one nucleotide to cause a grand change; it is just a matter of how important that gene is. We may not find anything at all, but that means we are saving the trouble of other researchers who may have a similar hypothesis in the future.

Acknowledgments:

I would like to express my deepest gratitude to Dr. James Youngblom, who played a tremendous role in this research. Dr. Youngblom dedicated much time out of his busy schedule to provide his guidance and knowledge in order to make this study a possibility. I am truly honored to have been able to work with the professor who originally sparked my passion for genetics.

I would also like to thank my wonderful organization, Alpha Xi Delta. My sorority allowed me

the opportunity to work alongside children with Autism and grow an immense compassion for Autism Speaks.

I am also extremely grateful for the research participants of this study and their families. I am touched at the opportunity of being allowed to try to make a difference in the Autism community.

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Diagnosing dyslexia

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Abstract

Understanding mental diseases and disorders stems from research on polygenic traits. Traits in an organism are coded from genes. Traits may be coded for by a single gene (monogenic traits) or by multiple genes (polygenic traits). Many developmental disorders are polygenic and the extent to which the environment will influence the expression of the trait will always vary. Development disorders in the brain such as dyslexia usually affect an individual's ability to think properly in different situations. The diagnosis of dyslexia has been an onset problem. Dyslexia untreated at a younger age can result in a child being held back in their education. Most children feel discouraged and confused when they are held back. Genetic testing offers a different approach to diagnosing children with dyslexia. The specific proteins that exhibit the most activity in the brain associated with dyslexia are KIAA039, DCDC2, ACOT13, DYX2, DYX3 and FAM65B. If any of these proteins are mutated by the genetic code, it will lead to a protein being constructed improperly. Understanding the proteins as a whole will serve a better diagnostic tool for diagnosing dyslexia.

Keywords: dyslexia, genetics, Y chromosome

Introduction

Behavioral genetics focuses on why people differ. For about a century psychologists would say that the environment plays a very important role in disorders and diseases. However, there is a new approach in understanding mental diseases and disorders. Understanding mental diseases and disorders stems from research on polygenic traits. Traits in an organism are coded from genes. Usually when referencing a trait there is only a single gene that codes for that trait. Sometimes however, you may have multiple genes coding for one trait (Polygenic trait). Many developmental disorders are polygenic. Every trait in every organism is heritable; the extent of how much the environment will influence the trait will always vary.

Background and literature review

Development disorders in the brain such as dyslexia usually affect an individual's ability to think properly in different situations. This puts people with development disorders at a disadvantage among their peers. There is a broad array of mental disorders that are currently known. In the *Journal of Biological Psychiatry*, the article *Genetics and Mental Disorders* states that one in five Americans over their lifetimes, irrespective of age, gender, or race, will have issues associated with developmental disabilities (1). Another study by the University of Michigan illustrated that, "About 70-80%

of all of reading, writing, and spelling difficulties is due to dyslexia. In America it is thought that up to 17% of the population has some type of dyslexic disorder" (2). This disorder has a serious effect on a young student's learning capabilities; if a student cannot process what he or she is writing or reading it will be hard for them to conceptualize a concept.

The diagnosis of dyslexia has been an onset problem. In a recent study published by *Science News*, the article *Brain Training Aids Kids with Dyslexia* proclaimed that while "kids cannot be diagnosed with dyslexia until they reach the age of 9, they can be classified as "at risk for dyslexia" (3). This is because the current screening for dyslexia is observational; it is based on a child's ability to read and write. This leaves early diagnosis out of the scope since a physician must wait until a child is of age to read and write. If a physician attempts to diagnose at an earlier age it may not be a sound diagnosis since the child may actually be developing at a slower rate than others (5).

Dyslexia untreated at a younger age can result in a child being held back in their education. Most children feel discouraged and confused when they are held back. Genetic testing offers a different approach to diagnosing children with dyslexia. Genetic testing would be more effective than diagnosing the disorder later the child's life (age of 9). The genetic testing would provide a family with information that is necessary to know if a child has a predisposition to develop dyslexia embedded in their genetic code. When children are diagnosed at a

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younger age and the proper interventions are utilized, this can have a significant effect on their overall reading and language skills development (6). Instead of waiting for symptoms to appear, genetic testing will allow families to prepare the child's life in matters that will allow the child to thrive.

Diagnosing individuals using their genetic information and comparing it to a majority of the population has been both successful and inconsistent. Finding a link between a disorder and a gene has a few protocols to it. One, you must find a genetic marker (10). Every gene in the body is made up of two alleles (an allele is a variation of a trait) (10). There are two types of alleles, dominant and recessive. These alleles can code for a variety of different expressions. For example, a person with blue eyes has recessive alleles and a person with brown eyes has dominant alleles. These alleles make up genes that make up the phenotypes seen in organisms. Sometimes, an allele can serve as a genetic marker, or a link to a disease. A genetic marker is like a microscopic beacon that gives a rough estimate of where a disease may be located. In other words a genetic marker can be any DNA variation with a known location on a chromosome that can be observed and followed from generation to generation (4). Common genetic markers include genes that are easily coded for by their characteristics. Blood type is an example of a genetic marker (10). There are many different blood types, and if one person has a disease associated with a specific blood type then that would make a good genetic marker. For example the inheritance of blood types in families may also show a link to a family disorder/disease. If one allele of a blood type is associated with a disease and others are not, then you have a genetic marker (blood). It may be such that only people with blood types O are afflicted with the disease. Finding the marker is a challenge, and finding the specific allele involved with the marker is an even bigger challenge. There are more reliable markers or "beacons" across the body that can be used. These new markers are also known as single nucleotide polymorphisms that are found across the genome (10). Single nucleotide polymorphisms (SNP) are changes in the DNA that alternate the nucleotide sequence; they do not affect the individual (6). Figure 1 shows how an

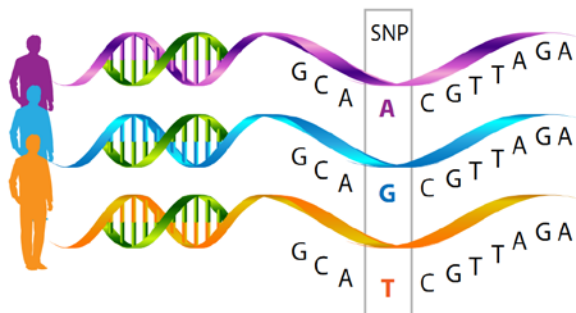


Figure 1

SNP is just one nucleotide difference between individuals. To be considered a polymorphism rather than a mutation, the rare allele of the polymorphism must be seen in 1% or more of the population.

One of the greatest challenges of the biomedical enterprise is linking human genetic variation to very common disorders such as dyslexia. The struggle of associating the variation in SNPs with dyslexia is first finding the genes that are affecting the trait. A common method to link SNPs to diseases/disorders is genome wide association study (GWAS) and comparing it to electronic health records. This entails looking at all of the common SNP's that are affecting the phenotype of an individual (3). However, this approach was determined to be too broad and showed a lot of inconsistency because you were looking at millions of SNPs throughout the entire genome. A new approach that has showed some success has been a whole-exome sequencing study (WES). Instead of analyzing the entire genome of an individual, we can narrow down the sequencing into only the coding DNA. Instead of looking at millions of SNPs, now only thousands can be analyzed. Whole-exome sequencing can narrow down the sample even more, by analyzing only the SNPs that are associated with the brain. Rather than sequencing 100% of the genome, we could sequence 2%; this saves time, effort, and money. The study that showed success in this specific type of sequencing was one that homed in on familial hypercholesterolemia, which is a genetic condition that results in high low-density lipoprotein cholesterol and an increased risk of earlier-onset cardiovascular disorder (7). This disease is very similar to dyslexia in the sense that it is a polygenic disorder. There are multiple genes that affect the trait. The study for hypercholesterolemia showed that most people who had the disorder had mutations in that are associated specifically in proteins that code for the heart. Whole-exome sequencing allows us to know who is predisposed to the familial hypercholesterolemia disease. WES can be done in the same way for dyslexia. Looking for common mutations in the genes that code for the brain has good potential in diagnosing dyslexia. Knowing whether or not an individual will be prone to a disease allows them or others to control and manipulate their environment. In the case of hypercholesterolemia an individual can control their diet a lot better to prevent a heart attack. Diagnosing dyslexia in children could have a significant effect on their capacity for learning.

There is a common misconception that people with learning disabilities are incapable of learning. But in reality, those with learning disabilities just need the proper tools and guidance to allow them to learn at their optimal level, which hinges on early diagnosis and informed interventions. Most people may be held back or even drop out of school because of their learning

disability, and majority often don't know they have a disability. Dyslexia is a common disorder, and knowing the predisposition to the disease can calm the symptoms dramatically. The environment plays a significant role and in the severity of the disability, and if it is not manipulated in a favorable way its effects can be detrimental to the individual. So understanding how to diagnose the disorder in an efficient way at an earlier age will actually be more beneficial than waiting until the individual is at least 9 years old. There are many prospective students and bright thinkers who can benefit from having such a useful tool early in their life.

Methods:

The research that I will be conducting will be to analyze literature that focuses on dyslexia as a genetic disorder. I will be looking for research that examines mutated proteins in the brain that are now thought to be associated with the disorder.

Findings:

The brain is very complex. There are hundreds of genes in the genome that code for the proteins in the brain. The genes that code for proteins in the brain and may play a significant role in the emergence of dyslexia are found on chromosome 5. When the chromosome is mutated there has been observed a difficulty with working memory when trying to comprehend symbols, language and concepts. Working memory functions with our senses. First someone will stimulate their stimulus (seeing a symbol) then their mind will create a phonologic loop and visuospatial sketchpad to integrate the stimulus into their memory. When this is done enough it will actually allow someone to create a concept in their mind that will be integrated into their long-term understanding of the world, or other concepts associated with learning. When there are mutations on this chromosome there has been a lot of association dyslexia, however the chromosome is not a great diagnostic tool because of the variation within it. Sometimes there can be mutations in the chromosome in people who don't manifest the same behavior issues (or the triggers have not kicked in yet). This speaks to a limited diagnostic tool.

When diagnosing dyslexia it becomes more accurate for researchers to actually look for specific proteins specifically related to the disorder. Looking at the disorder by observing an entire chromosome can lead to a lot of variation. The presence of variation does not make the chromosome a good diagnostic tool. The specific proteins that exhibit the most activity with the brain associated with dyslexia are KIAA039, DCDC2, ACOT13, DYX2, DYX3 and FAM65B. If any of these proteins are mutated by the genetic code, it will lead to a protein being constructed improperly. Usually if there

is a problem with the biological structure, there will also be a problem with the resulting function (though in rare situations this may not always hold true). These proteins are associated with IQ language and reading. Although findings want to show that one protein is highly associated with dyslexia, it is actually more of a mosaic of all proteins being misfolded than just one being the diagnostic mechanism. Although many of these proteins are associated with dyslexia, none of them are certainly the diagnostic tool.

Finding the actual diagnostic mechanism responsible for dyslexia has been a challenge for scientists for many years. Understanding the proteins as a whole will serve a better diagnostic tool for diagnosing dyslexia.

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Is it sensory or social?

Determining the significance of Sensory Processing Disorder as a diagnosable disease by its relation to Autism Spectrum Disorder

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Abstract

Current statistics indicate that 1 in 68 children in the United States are diagnosed with autism spectrum disorder. Autism is a serious, lifelong, pervasive, neurological developmental disorder causing deficits in social interaction and communication. It is said that more than ninety percent of people with autism have atypical responses that are caused by common every day sensory stimuli. These reactions can be described as over responsive (an extreme sensitivity to the texture of clothing or food), under responsive (which may seem something like not being able to notice obstacles in their path), sensory seeking (chewing on various objects like shirt cuffs), or an inability to discriminate various types of sensory stimuli (not being able to differentiate auditory stimuli like *cat* or *cap*). The lack of published research related to individuals with symptoms of sensory processing disorder is an indicator of the importance of collecting data. A literature review of current research regarding both autism and sensory processing disorder discusses how the disorders interact and the biologically significant evidence that supports sensory processing disorder being defined as a separate neurological disorder. While atypical sensory responses are treated for those on the autism spectrum, others who do not qualify under the autism diagnosis are not eligible for therapy relating to sensory processing disorder, as there is not an accepted diagnosis. Establishing a paradigm and outlining diagnostic criteria and potential therapy is essential for providing services and therapies for those individuals living with sensory processing disorder.

Keywords: autism, sensory processing disorder

Introduction

Sensory processing disorder is characterized by an atypical response to sensory stimuli, as outlined above. There is not a standard diagnostic test for sensory processing disorder due to it often being found to have comorbidity with other neurological disorders. As a result, a specific diagnosis has not yet become generally accepted among therapists and professionals. There is treatment available for people on the autism spectrum, but those who do not qualify under an autism diagnosis are not eligible for therapy relating to sensory processing issues. Even though reliable diagnosis rates are not readily available, the number of parent groups devoted to sensory problems has more than tripled in the last few years, to 55 nationwide.¹ These groups strive to involve sensory processing disorder into becoming accepted, researched, and discussed in mainstream medicine. Therapists and researchers petitioned the American Psychiatric Association in hopes that sensory

processing disorder can be included in the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)*, which is the gold standard for diagnostic criteria. It still has not been accepted as a mental disorder, as many psychiatrists, pediatricians, and family doctors fear that sensory processing disorder could become overly diagnosed without proven research on treatment. This can be argued, as there is data readily available from children who fall under the autism diagnosis and are already receiving treatment for sensory processing disorder. This data can assess current services being provided to those individuals with sensory processing disorder who fall under the autism spectrum diagnosis, and assist in establishing treatment guidelines. Defining the differences between those on the autism spectrum and those with sensory processing disorder can establish a paradigm that will outline diagnostic criteria and create a subset of treatment which is essential for performing the appropriate research that allows for the proper services and therapies.

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¹ Carey, B. (2007, June 05). *The disorder is sensory; the diagnosis, elusive*. Retrieved from <http://www.nytimes.com/2007/06/05/health/psychology/05sens.html>

Discussion

The sensory system is the building block of the central nervous system. Lack of proper function can directly affect other systems and impede learning potential. Research that studies the biological markers in the central nervous system can begin to define the differences between sensory processing disorder and autism spectrum disorder. If we are able establish a model for the relationship sensory processing disorder has with autism spectrum disorder biologically, we can begin to understand how sensory processing disorder is exhibited behaviorally among children who do not exhibit autism symptoms (such as social, emotional, and communication deficits). Due to sensory processing disorder not being listed in the DSM-5, children with sensory processing deficits who do not meet the criteria for autism spectrum disorder are still widely understudied. The atypical reactions previously listed that are found in those with sensory processing disorder who fall under the autism diagnosis can vary among each individual person's behavioral response to their environment. These responses can make those with sensory processing disorder appear incapable of sitting still or listening, constantly complaining about the feeling of clothing, or not be able to hold a conversation or maintain a single train of thought in a restaurant due to background noise that they are unable to tune out. Without proper therapy for those not on the autism spectrum exhibiting sensory processing symptoms, common every day sensory stimuli may create discomfort in their environment and impede learning.

Results

Through my work, I have found a small amount of current published studies that have indicated that there is biologically significant evidence to support sensory processing disorder becoming a diagnosable neurological disorder. In 2013, the University of California San Francisco (UCSF) published a study that was "the first to find that boys affected with sensory processing disorder have quantifiable regional differences in brain structure when compared to typically developing boys".² Then in 2016, UCSF followed up this study and included females, stating that

² Leigh, S. (2016, January 26). *Brain's wiring connected to sensory processing disorder*. Retrieved from <https://www.ucsf.edu/news/2016/01/401461/brains-wiring-connected-sensory-processing-disorder>

³ Ibid

⁴ Arnett, A. B., Chang, Y., Harris, J., Hill, S. S., Marco, E. J., Mukherjee, P., & Owen, J. P. (2014, July 13). *Autism and sensory processing disorders: shared white matter disruption in sensory*

they "have found that boys and girls with sensory processing disorder (SPD) have altered pathways for brain connectivity when compared to typically developing children, and the difference predicts challenges with auditory and tactile processing."³ This research establishes that there is a biological basis for the disease and it has posed the question of how these differences compare to those associated with other neurodevelopmental disorders. In a study conducted by researchers at the University of Minnesota, children who exhibit atypical sensory behaviors to the same or greater degree as children with autism show impairment in "white matter microstructure, and that this white matter micro structural pathology correlates with atypical sensory behavior."⁴ This study uses diffusion tensor imaging (DTI) fiber tractography to show connectivity of specific white matter tracts in boys with autism and boys with sensory processing issues, relative to typically developing children. This research is significant because it includes studying the white matter microstructure (the area of the brain that affects learning, various brain functions, and what deals with the coordination and relay between different brain areas) and it indicates variations between the children with sensory processing and autism, supporting the theory that sensory processing disorder can be found among those without another formal neurodevelopment disorder diagnosis.

Translational impact

Practical applications of diagnosing and treating sensory processing disorder can be taken from Occupational Therapists who currently treat those under the diagnosis of the autism spectrum. The current standard is to provide a sensory integration diet, as outlined by sensory integration therapy. This is a series of activities that are specifically tailored to an individual's needs, which occurs by exposing them to various sensory stimuli in a repetitious, structured environment. The goal is to have the sensory system adapt to whatever stimuli are impeding their ability to appropriately respond.⁵ In addition, a functional behavior analysis can potentially be conducted by a Board-Certified Behavior Analyst, to find the purpose of the behaviors that are related to the sensory response.

pathways but divergent connectivity in social-emotional pathways. Retrieved from <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0103038>

⁵ Kelly, K. "*Sensory Diet*" *Treatment: What You Need to Know*. Retrieved from <https://www.understood.org/en/learning-attention-issues/treatments-approaches/therapies/sensory-diet-treatment-what-you-need-to-know>

Individuals with sensory processing disorder can also be given an opportunity to attend social skills classes if they have extreme atypical reactions that cause them to avoid social interaction due to the environment. Diagnostic criteria can also be formed from the current outlined criteria provided within the umbrella of the autism diagnosis, as well as additions that mean to satisfy all the variations in sensory response. The diagnostic criteria could potentially be outlined as:

- hyper- or hypo-reactivity to sensory input, the lack of sensory discrimination, or an unusual interest in sensory aspects of the environment
- can be described by three main variations: over responsive, under responsive, or sensory seeking
- all three can be displayed at one point of another or together depending on the stimuli, as well as lack sensory discrimination
- symptoms must be present in the early developmental period

Future research

During the summer of 2018, I will conduct a research experiment to find further support for the biological basis of sensory processing disorder. This experiment attempts to establish a paradigm that will assist in defining the differences between autism spectrum disorder and sensory processing disorder and determine the characteristics of sensory processing disorder behaviors while examining biological data. As it stands currently, we are attempting to receive data from an open field test regarding the social interaction and sensory response for a set of lab mice. These mice will then become space irradiated and we will be provided the dissected brains. Examination of any anatomical and physiological changes in various lobes or sections of the brain that are known to be related to autism and sensory processing disorder will be

discussed and recorded. A qPCR lab experiment will then be conducted to measure and record variations in chosen proteins. Other potential discussions will include sex, age, body weight, and long-term effects. Further research can hope to address whether those with sensory processing disorder avoid social interaction and certain forms of communication due to sensory stress.

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The endangerment and conservation of cheetahs (*Acinonyx jubatus*), leopards (*Panthera pardus*), lions (*Panthera leo*), and tigers (*Panthera tigris*) in Africa and Asia

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Abstract

Increasing habitat depletion, habitat degradation, and overhunting in Africa and Asia have resulted in the designation of the four largest species of felid (cheetah, leopard, lion, tiger) as vulnerable or endangered on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species. Scientists interested in understanding and potentially slowing the disappearance of these species need access to causal factors, the past and current range of each species, the life history, and importance of conservation. This article presents one such resource with all of this information compiled in a place that is easy for people to get to. The primary target of this article is educators but will be useful to anyone interested in these species, their current state, and their future peril.

Keywords: cheetah, leopard, lion, tiger, endangered species, conservation, Old World, big cats, habitat

Introduction

Conservationism is a common term heard in many settings in the modern world, implying that an effort to conserve species needs to be made and enforced. However, talking about conservation is not enough. There have been few to no changes made to improve the state of some ecosystems, while there have been a few successes, most habitats continue to be depleted. Rainforests are still being depleted and illegal poaching is still a major issue in many parts of the world. It is necessary how these smaller conservation efforts can be part of a global effort to conserve the planet.

To begin, this article will be different from other articles. This is an intensive literature review and compilation effort. This article will not follow the typical structure of a scientific paper because there is no experiment being tested or a true question being answered. This work is meant to be informative and full of information that can be used in many settings ranging from wildlife education to advocating for climate change interventions. The basis of the endangerment of these species is part of a global problem. This article can be used by other researchers as an example of problems that need to be addressed to benefit the planet as a whole. I hope that this article will serve as an education tool and a research tool for other conservationists in the future.

Generally speaking, there are several stages to species restoration that are utilized in some parts of the

world with some species programs. These steps are used to analyze whether or not a species is in danger and are then used to halt the decline and reverse it. The first is population decline; this is the obvious decline in a population that incites a need for a change to be made. This can be seen over time through observation and monitoring of populations. Crisis management is the next step, in which obvious actions are taken to halt the decline rather than allow it to continue. This is the planning stage, when a strategy is formed to halt the decline. The next step is stabilization which is imperative if a species is to be able to recover. In this stage, numbers do not continue to fall, but rather become stable. Precarious recovery, the next step, is the gradual increase in population and survival of offspring. This step can be small, or large, as long as there is some form of recovery observed. This is followed by sustained recovery which is when the species begins to grow at a faster rate and grows exponentially. The final step is also very important because it entails managing the growing population in relation to the environment and making sure they do not exceed the carrying capacity of the area (Meena et al. 2011). However, species restoration, no matter how effective and beneficial, is counterproductive if the is not sufficient habitat.

For each species, I have amassed information pertaining to the classification, habitat, past and current ranges, hunting methods utilized, preferred prey, and the effects of humans. This article can be used as a tool

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to educate the public about the problems associated with species decline as well as habitat degradation and depletion. All of these factors together contribute to a unique situation for each species, and therefore a slightly different approach is necessary to ensure conservation success for each species. There are conservation efforts being made for each species, but in some cases, such as the cheetah, the need is far greater. Some efforts will affect the entire ecosystem, like the lion, because they are a keystone species. A keystone species is the species that the entire ecosystem relies upon for regulation and if the species were to disappear the system would suffer drastic consequences.

Cheetahs

Classification, Habitat, and Range

Cheetahs may be identified by their simple spot fur pattern, which is unique among cats (Figure 1, Animal Club 2017). They have lighter ventral sides and their tail is tipped with stripes. There are also stripes on their faces. This pattern makes them unique and easy to distinguish from other big cats. They are typically a meter tall at the shoulder and can reach up to around 70 kilograms (Kelly 2001).

Cheetahs occupy a habitat that is composed of grassland and woodland (Caro 1994). Some of their typical home ranges fall on land preserves, and these populations are therefore protected. However, other parts of their ranges are not located in these protected areas. Figure 2 shows that there has been a significant decrease in the home range of the cheetah, specifically in Asia and Northern Africa (Cheetah Conservation Fund 2017). The IUCN calculated this exact range to be approximately 10% of the historical range (IUCN Red List 2017). Of the species examined in this study, cheetahs suffer the most from kleptoparasitism, in which another animal steals their kill. Cheetahs are most afflicted by lions, hyenas, and wild dogs. The individuals that live in denser habitats encounter these threats less often (Hayward and Henschel et al. 2006).



Fig. 1 Cheetah (Animal Club 2017)



Fig 2. Cheetah Distribution Map (Cheetah Conservation Fund 2017) The gold color represents the approximate current range of the cheetah, while the tan represents the approximate historical range of the cheetah.

Prey and Hunting Methods

The main prey species of cheetahs include but are not limited to impala, blesbok, kudu, steenbok, duiker, Thomson's gazelle, springbok, and hartebeest. They are opportunistic hunters, hunting whichever of the preferred species they come across, but prefer prey of similar body size or smaller to reduce the chances of kleptoparasitism. The decline of preferred prey in a certain area can lead to the decline of the cheetah in that area (Howard et al. 2006). The diet of the cheetah overlaps with most large predators with which they share habitat. Cheetahs and wild dogs overlap the most due to similar body size (Owen-Smith and Mills 2008). Within their dietary niche, the lion, leopard, and hyena outcompete the cheetah. Cheetahs outcompete the wild dogs, but only marginally because wild dogs hunt in packs (Hayward and Kerley 2008).

Cheetahs have five different hunting strategies. The first is waiting for prey to come closer, during which the cheetah would lay camouflaged for the prey to come within striking distance. Another tactic is the slow approach and then sprint during which the cheetah would stalk up on the prey and then hopefully kill it with a sudden burst of speed. Another less common method was the dead charge in which a cheetah would put on an immediate burst of speed into a large group of prey and potentially catch them by surprise. The most famous method is the stalk and chase, when the cheetah characteristically stalks closer to the prey and then a chase ensues. The last method is to flush out prey which is also rarely used because it takes a lot of useful energy to flush out the prey before the chase happens. Cheetah coalitions are also not as successful as individual hunting (Caro 1994). They can lose up to 12% of kills

to kleptoparasites but still have high success rates which are influenced by high energy input. Cheetahs can also experience morphological limitations, low energetic benefit, and high energetic costs throughout hunting (Howard et al. 2006). In general, cheetahs rely on speed for hunting, for which they are most famous. Throughout the year, their hunting range can fluctuate because they are forced near water sources during the dry season, but can use open land to their advantage during the rainy season (Hilborn et al. 2012).

Endangerment Factors

One major factor leading to cheetah population decline is poaching. Cheetah populations were once hunted down to approximately 100 individuals. This led to a small gene pool during reproduction, which is resulting in several health issues becoming increasingly common in the species. The cheetah coat is often sought out for clothing items and similar items. Also, due to the kleptoparasitism that cheetahs endure from other top carnivore species, cheetahs are often forced to go after easy prey that may include farmer's livestock. The farmers will then often shoot the invading predators to save their own livelihood. The close quarters between people and cheetahs are intensified by the increasing size of the Sahara Desert (Caro 1994).

Habitats are shrinking for one major reason: human development, which is also leading to the growth of the Sahara Desert by desertification. Tourism is a major threat because these solitary creatures avoid human populations. This effect has been recorded in the greatest amount in the Serengeti. This tourism and human borders expanding is creating an incredible amount of habitat destruction, which is the number one threat to cheetah populations (Caro 1994). Cheetahs also depend on their habitat for camouflage while hunting; without these habitats their coat is useless to use as an advantage (Kelly 2001).

All of these factors support the same conclusion: habitat loss is a major contributor to the decline of cheetah populations. Conservation efforts are being made by increasing populations on nature reserves and through captive breeding programs the health of the species in captivity in recovering. Conservationists hope to release some of the captive population to interbreed with wild populations to benefit the health of the species as a whole.

Leopards

Classification, Habitat, and Range

Leopards are one of several cats that have a rosette fur pattern as seen in Figure 3 (Animal Club Leopard 2017). They can reach head to tail lengths of up to 2 meters, and males can weight up to 90 kilograms. This species is often mistaken for the jaguar of South

America, but is distinguishable by the size of its skull. Leopards occupy a wide range of habitats that span from semi desert to rainforest while avoiding grasslands (Bertram 1978, Balme et al. 2007). They are one of several cats that are common in both Africa and Asia, so the fact that they occupy a large variety of habitats is not surprising. Figure 4 shows that their range has also shrunk back to corners of Africa and Asia (Broad 2012). The IUCN calculated they have experienced a 61% loss of historical habitat (IUCN Red List 2017). Leopards are at a slight advantage because of their large variety of habitat (Balme et al. 2007). They prefer habitats with good prey, which still allows them a large variety of habitats (Stein and Hayssen 2013).



Fig 3. Leopard (Animal Club Leopard 2017)

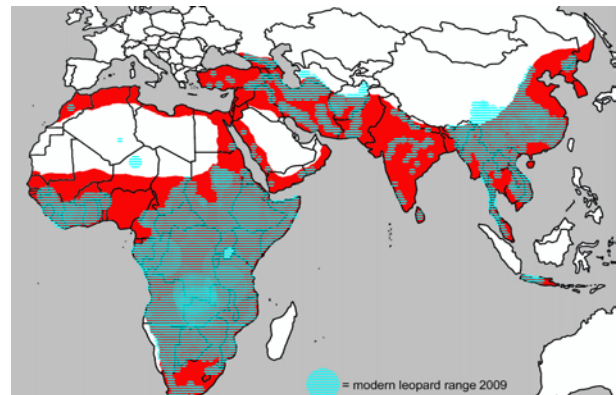


Fig 4. Leopard Distribution Map (Broad 2012) The blue color represents the approximate current range of the leopard, while the red and blue area represents the approximate historical range of the leopard.

Prey and Hunting Methods

The preferred prey of the leopard includes impala, kudu, giraffe, warthog, zebra, steenbok, grey duiker, and blue wildebeest (Bailey 1993). Within their dietary niche, leopards are only outcompeted by lions (Hayward and Kerley 2008). However, they do not compete with lions very much because each species focuses on a certain size prey; lions hunt larger individuals and leopards hunt smaller individuals

(Owen-Smith and Mills 2008). Leopards must hunt prey that is closer to their own body size or even smaller because they utilize trees when they are hunting to keep other large predators from stealing their kills. Because leopards have a variety of habitats, they experience a lower level of competition than other species (Bailey 1993).

Leopards use catchability as a factor in determining prey, and then typically use the stalk and kill method (Balme et al. 2007). This method utilizes their camouflage of the rosette pattern amongst filtered light (Allen et al. 2011).

They require dense concealment to be successful during hunting, but may still have issues because they are solitary hunters (Hayward and Henschel et al. 2006). Most of their hunting is done in areas of semi-vegetation as compared to open land or heavy vegetation (Balme et al. 2007). The leopard has also been known to drop out of trees or scavenge on rare occasion, but they consistently carry prey similar to their body size up into the trees, while they consume small kills immediately on the ground (Bertram 1978).

Endangerment Factors

One threat is human populations, which they avoid at all costs (Toni and Lodé 2013). The other threat is the fact that they share habitat with tigers, but they are restricted by the presence of the larger cat (Stein and Hayssen 2013). Another threat would be that their prey is often depleted by human hunting and habitat loss (Bailey 1993).

Leopards are afraid of human presence and remain as solitary as possible throughout their lifetime. Tigers also frighten them, while simultaneously competing with them. Furthermore, as in the case of the cheetah, the number one threat to this species is loss of habitat (Bailey 1993). Leopards rely on their habitat and coat pattern as a form of camouflage and advantage during hunting (Allen et al. 2011). Unfortunately, leopards are another species that suffer from poaching.

Lions

Classification, Habitat, and Range

Lions reside mostly in grasslands but can be found in woodlands as well (Bertram 1978). They choose a territory based on its capability to support the size of the pride. Lions have the simplest coat of the cats that are in this study, possessing fur that is simply a sandy color with a white belly. The males also have a unique black tuft of hair on their tail (Bertram 1978). The mane is also a distinctive feature of this species, but not all subspecies have manes, so it is not the most reliable form of identification as can be seen in Figure 5 (Howard 2015). Lions can be up to 3 meters long from head to the tip of the tail, and males can weigh up to 250

kilograms (Bertram 1978). Another distinctive feature of the lion is that they are the only cat in this study that live in prides. Figure 6 shows that their range has dramatically decreased and only spans a small fraction of Africa and a very small area of Asia (Panthera 2015). The IUCN calculated this to be 17% of the historical range (IUCN Red List 2017).



Fig 5. Lion (Howard 2015)

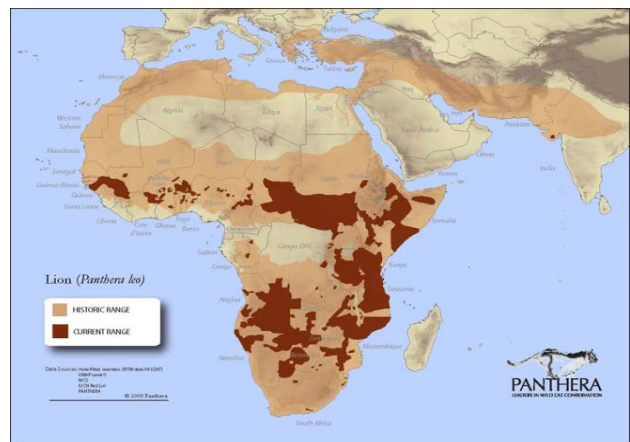


Fig 6. Lion Distribution Map (Panthera 2015) The dark brown color represents the approximate current range of the lion, while the tan color represents the approximate historical range of the lion.

Prey and Hunting Methods

The preferred prey of lions includes zebra, wildebeest, hartebeest, topi, eland, waterbuck, impala, gazelle, and warthog (Bertram 1978). Lions outcompete all of the other predators in both their preferred niche and their overall dietary niche. The only other species they may compete with would be hyena, but due to overall body size, the lion is still the top predator (Hayward and Kerley 2008). Because lions use the pack hunting strategy, they are typically more successful than other species or individual predators. This strategy

ensures that they can successfully hunt prey twice their body mass to feed the entire pride (Owen-Smith and Mills 2008).

Endangerment Factors

It is often a topic of news of how threatened lions are in the modern day. A lot of this can be attributed to the fact that lions prefer a habitat that is better to hunt in rather than a habitat where prey is more abundant (Balme et al. 2007). This is an advantage and a disadvantage. It is an advantage because the cover does make their hunting more successful. It is a disadvantage because they are being forced to follow food sources because they no longer exist in beneficial habitats.

Human populations moving too close have forced the herds to move on. Lions have no choice but to follow or starve. When they follow, they are less successful hunters because they are working in a less than optimal habitat. Therefore, as with the other species focused on in this study, habitat depletion is the number one factor for their endangerment as well. Humans are also responsible for the poaching of lions, which is another big feature factoring into their endangerment.

Tigers

Classification, Habitat, and Range

Tigers inhabit a variety of habitats, overlapping with leopards. The two species do not compete though because the tigers are so much larger (Stein and Hassen 2013). This species tries to avoid human populations as well as they can, though there are many areas where they live closely together.

Tigers have one of the most recognizable coats, the unique strips that each individual possesses as seen in Figure 7 (Smithsonian's National Zoo and Conservation Biology Institute 2017). Tigers can reach nose to tail tip lengths of up to 3.5 meters and can weigh up to 300 kilograms (Stein and Hassen 2013). Figure 8 shows that their range has shrunk back to the edges of Asia as compared to their historical range which also included much of the interior of the continent (McGonagle 2012)



Fig 7. Tiger (Smithsonian's National Zoo and Conservation Biology Institute 2017)



Fig 8. Tiger Range Map (McGonagle 2012) The brown color represents the approximate current range of the tiger, while the light yellow and brown represent the approximate historical range of the tiger

The IUCN has calculated that tigers occupy only 6% of their historical range (IUCN Red List 2017)

Prey and Hunting Methods

Tigers shared prey preferences with the leopard, including impala, kudu, warthog, and zebra, but it is their disparate sizes that keep these two species from directly competing for prey. Tigers prefer prey their size or smaller, but due to the significant body size difference between tigers and leopards, tigers still go for larger prey than leopards (Hayward et al. 2012, Kumaraguru et al. 2011). Tigers also eat as much as they can in one sitting so they do not rely on their prey being small enough to drag up into trees. Their leftovers feed many other scavenger species in their habitats. Tigers rely on their fur pattern as camouflage during hunting, using low light environments as well as similar colored backgrounds such as long grass.

Endangerment Factors

The areas that tigers inhabit are some of the most populated parts of the planet, bringing the boundary between tiger habitats and human villages closer together. These thinning boundaries sometimes lead the predators too close to a human population for comfort and are killed out of fear or protection. The tiger is a highly revered species in many rituals and religions, in which parts of the tiger are used in the worship. Oftentimes, only small parts of the animal are taken such as the paws or the tail, leading to a large loss for a small sacrifice. Due to their coat, they are often the victim in trophy hunting as well.

Conservation

Cheetahs are considered to be in a vulnerable state, with a known population of 6,700 individuals in 2015, according to the IUCN. The number of countries where

this species is regionally extinct exceeds those where they are native. In an attempt to preserve the species, there is a breeding program in place in Africa in which individuals from captive populations are exchanged throughout the program to try and keep the gene pool as large as possible despite their still decreasing population. The USA has a similar program in which the population is used for educational purposes because the species is not native in this hemisphere (IUCN Red List 2017). The poor genetic condition of the cheetah is marked by a high level of juvenile death as well as the inability to combat infectious disease (Caro 1994). In some countries, the species is protected by law against poaching and trading. However, these laws have been put in place too late in some cases because the cheetah is already extinct in these places or they are consistently broken by those supporting the black market.

Leopards are also considered to be vulnerable according to the IUCN in 2016, with an estimated population of fewer than 2,500 individuals. This species has seen a majority of regional extinction in the southeast corner of Asia, but they still thrive in heavily forested parts of Africa and Asia. Most countries of North and West Africa have listed the lands where leopards exist to be protected, but the areas are not large enough to support a large wild population. Each subspecies, the Amur Leopard (*Panthera pardus orientalis*), the Arabian Leopard (*Panthera pardus nimr*), the Javan Leopard (*Panthera pardus melas*), the Sri Lankan Leopard (*Panthera pardus kotiya*), and the Persian Leopard (*Panthera pardus saxicolor*) has their own captive breeding program for conservation (IUCN Red List 2017). Luckily, there are many subspecies of leopard so they will not experience the same poor genetic condition as the cheetah because they have enough sufficiently large populations to cross breed and maintain a large gene pool.

Lions are considered vulnerable as well with a known population of 7,455 individuals as of 2014. Lions are considered to be regionally extinct in 52% of their historical range, with most of this area in the Middle East. This species is commonly found in protected areas, but there are no known laws in place specifically protecting them. Instead, many countries of Africa have put their own conservation plans in place that also include conservation of habitats and ecosystems (IUCN Red List 2017). This is one of the species in this study in which conservation efforts include habitat preservation. This is because the lion is a keystone species, meaning that it is the most important species in the ecosystem, and it helps to keep the entire system stable. If lions were to go extinct, there are no other large competing predators in Africa that could fill their niche. Cheetahs and leopards both hunt smaller prey and because they are solitary animals do not feed as much. The large ungulate populations of Africa

would eventually grow to out-of-control levels, consuming any and all vegetation as well as human crops. This could in turn lead to the complete desertification of the continent, which would drive out human populations because the land would be uninhabitable, and the remaining animal populations would also die. A similar example of this was the extinction of the wolf in Yellowstone National Park. As the landscape began to suffer from increasing populations of elk, deer, and bison, people reintroduced wolf packs and the park has returned to its former state. However, if the lion population continues to decrease as it has been in the past years, there would no longer be a wild population with which to replenish the regionally extinct population. Captive populations would not be ideal candidates due to their lack of hunting knowledge, and that could lead to the only known populations of lions being in captivity.

Tigers are classified as endangered as of 2014, with a population of 3,194 individuals as of 2014. Tigers are in a unique position because the mortality of breeding females has risen above 15%, which is a highly dangerous situation. If the adult population of females drops to a low enough point, there will be no chance at recovering the species. This species is regionally extinct in much of the Middle East. However, there are worldwide efforts being made for the conservation of tigers. In 2010, 13 Tiger Range Countries drafted and adopted a Global Tiger Recovery Program, headed by Russia. The goal of this program is to double the population of wild tigers by 2022 through preservation of habitats, decreasing poaching and trade, and restoring tigers to their historical range (IUCN Red List 2017). Tigers also play an important role in ecosystems as a keystone species (Zhang et al. 2013). They play a part in population control which in turn leads to preservation of habitats. Breeding populations are prevalent in many countries around the world, with conscious efforts of maintaining a large gene pool for future population increases.

Conservation is important on many levels, starting at the species level and then working all the way up to global systems. There are already many species that have been lost, such as the western black rhinoceros, and many species that are on the cusp of extinction, such as the northern white rhinoceros. For future generations, these species will only exist in images or videos. For now, the four big cat species in this study still exist in the wild, but in lower and lower numbers every year. The key to preserving habitats is preserving species, which will benefit the globe as a whole.

Conclusion

To conclude, there are many factors leading to the loss of these big cat species around the world. The

amount of habitat that had been impeded upon by human populations has greatly impacted these populations in several ways. First, it has been proven that manipulating habitat structure can also affect how well or poorly a predator can hunt (Quinn and Cresswell 2004). It has also been proven that habitat is the key to the predator-prey relationship because it is so beneficial to the predator (Hilborn et al., 2012). This goes hand in hand with prey abundance, which is the other factor that predators rely on (Balme et al. 2007). Prey preference is a key factor in conservation as well (Meena et al. 2011). A smaller range of preferred prey with increased overlap between these species and other predatory species such as the wild dog or hyena can increase the impact of loss (Hayward and Kerley 2008). Within hunting strategy, each predator has their own unique way of being successful (Hayward and Hofmeyr et al. 2006). It is also known that groups may be more successful than solitary hunters, especially in the case of the lion and the cheetah (Owen-Smith and Mills 2008).

A more recent fear in the scientific community is that humans are the leading factor in what could potentially become another mass extinction event. Past estimates were that approximately four species went extinct per year, but now the estimates range into the thousands, implying that many occur every day. Most of these may be an insect or a remote species of frog and therefore have a small impact on the environment if any. However, if these top predators are lost, a much larger impact will be observed in the lack of population control of other species. If we are to prevent this Anthropocene Extinction and the presumed long-term effects on the worldwide ecosystem, we must work hard to conserve the species we have left and the habitats they rely on.

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Training of North American porcupine (*Erethizon dorsatum*) to allow for subcutaneous injections using positive reinforcement

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Abstract

Most captive animals live well past their average lifespan in the wild and this longevity increases the frequency and number of medical procedures needed to maintain their health and welfare. Most procedures require that the animal be restrained in some way, which can produce stress and trigger aggressive behavior. Positive reinforcement training can be used to lessen the stress experienced by the animal during minor medical procedures such as vaccinations, blood draws, and administering medications, and to protect the handlers and veterinary staff from physical adaptations, such as sharp teeth, claws, or quills, that could pose a potential threat. A squeeze box is often used to gently restrain small-to-medium sized animals during medical procedures, but abrupt introduction of the apparatus can result in extreme confinement-related stress and aggression. The North American porcupine (*Erethizon dorsatum*) is a good candidate for squeeze box restraint and this paper presents the formulation, implementation, and outcome of a shaping plan developed to introduce and acclimate a young North American porcupine at the Lindsay Wildlife Experience in Walnut Creek, California, to a squeeze box. This shaping plan divides the medical procedure of giving subcutaneous injections into small steps to which the porcupine was introduced and acclimated during three training phases completed January-April, 2018. The use of a squeeze box as a form of restraint proved to reduce stress in the porcupine and also increased the safety of the keeper and veterinary staff. Some amendments to the shaping plan were made, but all retained training goals were completed within the four-month time period of the project. This shaping plan establishes a protocol for injection training for North American porcupines using a squeeze box that can be expanded at facilities that house North American porcupines for use in other procedures and adapted for use with other small-to-medium sized, potentially dangerous animals.

Keywords: porcupine, shaping plan, positive reinforcement

Introduction

Non-releasable wild animals serve as awe-inspiring ambassadors for their species and allow the average person to come into close contact with many species they will never have the chance to see firsthand in the wild. Non-releasable animal ambassadors come to be housed in captive facilities through several different scenarios. The most common include a debilitating injury that prevents the animal from being successful out in the wild. In other situations, animals are raised in close proximity to humans and thus never develop the proper fear response to humans and develop instead a dependency on them for survival. This is known as habituation. The care for these non-releasable animals involves, but is not limited to, cleaning, feeding, veterinary care, enrichment, and training. Several species of mammals have been found to have increased longevity in captive situations due to the lack of stressors including predation, food availability, disease, and competition (Tidieri et al 2016). However, with this increased longevity comes an increase in health complications associated with old age. In zoos and other

animal care facilities, veterinary care is available for animals whether it be an on-call veterinarian or a veterinarian resident on site. However, the experience of veterinary exams and medical procedures can be very stressful for captive animals as well as their keepers and handlers. Repetitive exposure to high stress situations is harmful to the physiology of the animals and can thus shorten their lifespans. A common strategy among zoo keepers to help lower the stress of animals during medical examinations and procedures is to use positive reinforcement training to familiarize the animal with the steps of the procedure before the actual date of the exam.

Positive reinforcement training (PRT) is a form of operant conditioning used in modern zoos to capture and cue specific behaviors and increase their repeatability by rewarding animals for performing such behaviors (Skinner 1938, Skinner 1966). The goal is to have the animal associate the performance of this behavior with a positive experience—such as food or tactile interaction—that helps motivate the animal to perform the behavior on cue in order to have that positive experience again. Despite the lack of natural stressors mentioned previously, such as predation and

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competition for resources, there are still stress-inducing situations that could arise in the environments of animals in human care. Psychological welfare of animals in human care can be compromised due to lack of control over environment, lack of ability or opportunities to display species-specific behaviors, and negative human interaction. The introduction of PRT to the daily husbandry of animals in human care has been shown to have several positive effects. In most cases, it reduced the occurrence of abnormal and stereotypic behaviors (Pomerantz & Terkel 2009, Spiezio 2017). This can be attributed to the increased control the animal has of its environment and the opportunity for the animal to choose how it spends its time and exerts its energy. PRT is a form of both environmental and psychological enrichment because it allows for physical manipulation as well as problem solving which offers opportunities for novel learning through the variability of the animal's daily schedule and husbandry (Ward & Melfi 2013). PRT also serves to create a positive relationship between caretakers and animals by building trust in training sessions which helps to create a relaxed atmosphere in situations that would traditionally be stressful for animals—such as veterinary exams (Ward & Melfi 2013, Spiezio et al 2017).

Through PRT sessions, animal keepers can promote natural behaviors that allow for an animal's physical health to be monitored. With close monitoring a keeper can immediately determine whether an animal's body condition has begun to deteriorate based on musculature or if an injury has been occurred by noticing a limp or cut made visible during the physical activity of the training session. By participating in regular training sessions, keepers can catch the incidence of injury or illness quickly and can then arrange the proper medical care. Also, with the knowledge of upcoming medical treatments, keepers can prepare an animal for a medical exam or procedure through training sessions. For example, at the Oakland Zoo in California, the natural behavior of leaning and rubbing against trees to scent mark territory borders in tigers (*Panthera tigris*) has been captured to be used for medical training with the animals. The tigers are asked to lean against a chain-link fence so that a veterinary technician on the other side of the fence is able to have access to the tiger's side to administer an injection without sharing space with the tiger. This is a common method of providing veterinary care for animals in facilities that have a protected contact policy, where, for most species of animals, keepers and other staff always have at least one barrier between themselves and the animal to promote both human and animal safety.

An 18-month old female North American porcupine (*Erethizon dorsatum*) named Penelope (Figure 1) is housed at the Lindsay Wildlife Experience in Walnut Creek, California, and will receive care there



Figure 1. Penelope at approximately 1 years of age.

for the rest of her life. A North American porcupine in the wild typically lives between five to seven years, but in captivity they can live up to 20 years. Penelope is a non-releasable animal ambassador, used in educational programming to spread awareness about her species and conservation of natural lands. Born in captivity, Penelope cannot be released to the wild because she was not parent-raised, therefore, she did not learn the proper behaviors from her mother to be successful in the wild. Also, North American porcupines are listed as a species of least concern by the International Union for Conservation of Nature (IUCN) and there is not an active reintroduction program for this species because their populations are not currently reported as in decline (Emmons 2016). One benefit provided to Penelope for living in a captive situation is long-term veterinary care, including any vaccinations, antibiotics, or other medical procedures necessary to ensure her best health and well-being.

The defenses that help North American porcupines survive in the wild, however, complicate veterinary care in that most surfaces of their body—excluding the stomach, bottoms of feet, and parts of their face—are covered in approximately 30,000 quills (Cho et al. 2012). North American porcupine quills are distinctly different in structure from the quills of other related species of porcupine in that the ends of their quills have microscopic barbs that increase penetration and adhesion to flesh (Cho et al. 2012). Because these quills are potentially dangerous to handlers and veterinarians it is necessary that some sort of restraining or protective device be used to make medical procedures safer for both the human and the animal.

For a North American porcupine, a squeeze box eliminates some of the danger their quills pose. When Penelope is relaxed, her quills lie flat against her skin. If she is startled, her muscles contract and her guard hairs are lifted to expose the erected quills beneath (Figure 2). A squeeze box keeps the guard hairs from lifting to expose the quills and also places a barrier

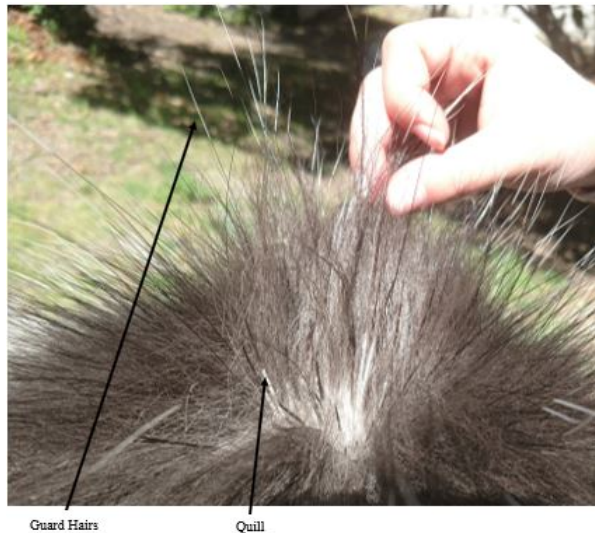


Figure 2. A photo of Penelope's guard hairs being held erect to expose quills beneath, resembling the posture of a startle response.

between the veterinarian and the animal. Penelope's squeeze box (Figure 3) is a milk crate with cardboard pieces attached to cover the holes in the crate. It also has a sliding wooden panel with an attached handle that can be used to decrease the internal volume of the box in order to keep Penelope from turning around. The box is 11 ½ inches tall, 19 inches long, and 13 inches wide, with a wide cut-out on one end that allows her tail to protrude so that the injection can be administered at this location. The tail was the injection site chosen by Lindsay Wildlife's resident veterinarian, Dr. Allison Daugherty, as the safest and most appropriate injection site for the animal.

A shaping plan for administering subcutaneous injections to North American porcupines using a squeeze box has not been published in a peer-reviewed journal before, and thus, the shaping plan I have created sets a precedent. If this form of injection training is successful, this shaping plan can be disseminated to other animal care professionals who look after North American porcupines and wish to provide stress-free veterinary care for the animals in their charge. Through the implementation of this shaping plan, both successes and failures in the use of a squeeze box will be discovered and documented, resulting in new protocols to increase welfare for North American porcupines in human care.

Methods

I designed my shaping plan by reviewing injection shaping plans written for other species of animals because I could not locate a shaping plan created specifically for North American porcupines, or any other porcupine species. I received access to these shaping plans through a seminar I attended at the Oakland Zoo hosted by their behavioral training consultant Margaret Whittaker (Active Environments 2007, 2010, 2014). The three main shaping plans that I used to develop my shaping plan were designed for chimpanzees (*Pan troglodytes*), ring-tailed lemurs (*Lemur catta*), and polar bears (*Ursus maritimus*). All three of these species are mammals but are very different morphologically from North American porcupines. Due to this fact, my shaping plan did involve a lot of novel ideas involving introduction of the squeeze box and cueing behaviors while Penelope was in the squeeze box. I modeled portions of my shaping plan where Penelope is being touched while inside the squeeze box after Temple Grandin's desensitization training with nyalas (*Tragelaphus angasi*) in wooden crates (Grandin et al. 1995).



Figure 3. Penelope's squeeze box, as designed by the Lindsay Wildlife Experience staff.

The typical first step in a shaping plan involving medical equipment is introducing the animal to the sight and presence of these tools. Animals should be rewarded for remaining calm when medical equipment is presented or placed near them. This is desensitization training, which allows the animal to grow accustomed to the presence of this new object and make the connection that when they see this object, something

positive will be received (i.e. food reward). A typical next step would be shaping the position of the animal. Depending on the set up of the enclosure, or whether the animal is worked with under protected contact, or the risk level of the species, this can vary widely. After desensitization and positioning of the animal have been accomplished to the satisfaction of trainers, progression to introducing the steps of the medical procedure can begin. Once behaviors have been established with repeatable consistent responses the training sessions can be varied in what behaviors are asked for and they do not need to follow a linear path. The variability helps to stimulate the animal mentally so that they are cognitively grappling with the concepts and behaviors being asked for, thus serving as enrichment and preventing the establishment of predictable patterns. In PRT sessions, several cues are used. These cues can be auditory, visual, or tactile varying on the species and the individual animal's temperament. One of the most important cues used is called a bridge. A bridge is a short, distinct cue that is used to communicate to the animal that they have performed the correct behavior and that a reward is on the way. A bridge essentially bridges the moment between the completion of a behavior and the receiving a reinforcer, which helps accommodate for the fact that the receiving of a reinforcer cannot be instantaneous because humans are slow.

My initial shaping plan included three phases, each with its own separate goals, that, when implemented in succession represent the steps of a routine injection procedure. The training phases were conducted from January to April of 2018. Training sessions were conducted one to three times a week, and sessions lasted from ten to thirty minutes in length depending on the behaviors being practiced that day. For the first half of the training period sessions occurred after 2 PM, for the latter half of the training period, sessions were conducted around 11 AM. Training sessions mostly took place inside of Penelope's enclosure, except for the end of Phase 3, where training sessions were moved onto a cart (see Phase 3). In following the cornerstones of PRT, if Penelope did not leave her den corner or approach trainers we took that as a sign that she did not want to participate in a training session that day. If at any point while Penelope was in the squeeze box she got restless and began vocalizing in abnormal ways, we interpreted that as Penelope wanting to stop participating. In this case, we lifted the squeeze box off her and ended the training session for the day.

For the first week of training sessions I worked to determine what types of food rewards worked best for different behaviors. I found banana chips worked best for behaviors with quick turn-around times, such as the "down" hand target and lowering the squeeze box over top of Penelope. When practicing to incrementally

increase the time Penelope was comfortable inside the squeeze box, food rewards that took Penelope longer to eat were preferred, these included rodent blocks (alfalfa hay pressed into cubes) and dried papaya. For tail touches (tactiles), banana chips and dried papaya were used.

My shaping plan protocol was approved by the Institutional Animal Care and Use Committee at California State University Stanislaus. I was assisted in the implementation of my shaping plan by the Animal Encounters staff at the Lindsay Wildlife Experience.

Phase 1:

In Phase 1 of the shaping plan, Penelope was introduced to all equipment that would be used in a routine injection procedure. This equipment included syringes, needles, tweezers, gloves, and her squeeze box. She was allowed to explore this equipment and was bridged for remaining calm and not displaying defensive posturing (i.e. turning of back to object with guard hairs lifted and quills exposed, extensive teeth chattering, or shaking of body to cause quills to rattle). Next, we used hand target training (where Penelope must touch her nose to the palm of her trainer to receive a reward) to position Penelope flat on all four feet. This position allowed for the box to be placed over her with her tail protruding from the correct end of the box. After Penelope grew accustomed to holding the "down" position we progressed to lowering the squeeze box over top of her and increasing the amount of time she was within the squeeze box. She was rewarded throughout her time in the squeeze box to reinforce that her calm behavior was the desired behavior.

Phase 2:

In Phase 2 of the shaping plan we began to introduce the sensation of Penelope's tail being touched to simulate the situation of the veterinarian touching her tail to find a location for proper injection. The act of touching Penelope's tail was referred to as tactile training. Tactile training is when a trainer or handler places their hands on the body of the animal. Penelope's tail is the chosen injection site so she must be conditioned to allow for us to touch this part of her body. The cue of "touch" was used when a gloved finger was involved in the tactile training. When Penelope remained calm while her tail was touched she was rewarded. The initial tactile was with a gloved finger, and ideally would progress to a capped syringe, blunted needle, and then pointed needle.

Phase 3:

In Phase 3 of the shaping plan, the squeeze box and tail tactiles were combined. Tail tactiles with a gloved hand were implemented first. Penelope was bridged and rewarded for giving no physical response (i.e. flinching)

to the touch. Then we progressed to tail tactiles with a capped syringe where the cue “poke” was used to communicate to Penelope the syringe would be touching her and not a finger. Again, she was bridged and rewarded for giving no physical response. Next, we progressed to tail tactiles with a blunted needle and finally a pointed needle. A needle was blunted by cutting off the tip and then wearing the cut end down on a coarse surface. Two trainers were needed to create the most efficient environment for this part of the shaping plan. One trainer was needed to fill the “trainer” role, where they were located at the end of the squeeze box where Penelope’s head was. They provided the reinforcer after a behavior was completed and bridged. The second individual filled the role of “technician.” They were located at the end of the box where Penelope’s tail protruded. They were responsible for the “touch” and “poke” cues as well as the bridge for the appropriate response.

Results & discussion

Phase 1:

Phase 1 of the shaping plan began on January 13, 2018 and concluded on February 5, 2018. All training sessions in this phase took place inside of Penelope’s enclosure and in the afternoon after 2 PM. In this phase she was introduced and desensitized to all equipment that would be present in a routine injection procedure. All equipment was placed inside enclosure with Penelope while keeper was present to monitor her responses and behavior. If Penelope approached the equipment and investigated it while remaining calm and not showing defensive posturing she was bridged and rewarded. The only time defensive posturing was witnessed, was when the wooden panel inside the squeeze box was moved which produced a shrill noise. Two sessions following this response were dedicated to desensitizing Penelope to the sound the panel made when it was moved. She acclimated to the noise quickly and did not show any defensive behaviors after this point. Penelope was allowed to climb onto squeeze box, into it, and explore its dimensions.

After desensitization was achieved, we progressed to the body positioning segment of Phase 1, where we used “down” hand targets to position Penelope flat on all four feet so that the squeeze box could be placed over top of her. We began with keeping her in the “down” position while holding the squeeze box about 2 feet above her, bridging her for remaining in the “down” position and remaining calm. Slowly, we lowered the squeeze box closer to Penelope, bridging for remaining calm. Eventually, we placed the box completely over top of her. We bridged her for remaining calm and still while inside the squeeze box. Over six training sessions we increased the amount of time she was within the

squeeze box from 10 seconds to 7 minutes. We bridged and rewarded her intermittently while she was within the box. We would give Penelope a “jackpot” at the end of her sessions (i.e. a high value treat, such as a piece of dried fruit or a shelled nut, that she only receives after successfully participating in training sessions). During Phase 1 there was only one day where Penelope chose to not participate in a training session. She did not leave her den area and approach her trainer. This was a perfect example of the control and decision making that animals have in regards to PRT. Penelope’s comfort inside the squeeze box is hypothesized to be due to the similarity between Penelope’s squeeze box and the type of dens porcupines usually take refuge in. Porcupines make homes in dark, enclosed spaces which is essentially the type of environment the squeeze box provides. This could also be due to Penelope’s temperament, or her trust in her keepers, or a combination of all three factors.

In my initial shaping plan, I did not include steps to help desensitize Penelope to the sensation of the sliding wooden panel being pushed in to limit her range of motion so she can not turn around in her squeeze box. Keeping her facing one direction is ideal and necessary so that Penelope does not pull her tail away mid procedure. She is a rodent, and thus has the flexibility to contort her body and turn herself a complete 180 degrees in the squeeze box if the wooden panel (or squeeze panel) is not pushed in. In my finalized shaping plan, I plan to include steps for desensitization to lessening her range of motion in the box.

Phase 2:

Phase 2 of the shaping plan began on February 11, 2018. Three sessions were conducted where free-contact tail touches were attempted as outlined in phase two of the shaping plan. Penelope exhibited nervous and defensive behaviors in response to these touches, indicating she was not comfortable and confident in this type of contact with her trainers. Often when a trainer attempted to touch her tail she would turn her body swiftly so that her back completely faced her trainer and her dorsal muscles tensed to raise her guard hairs and expose her quills. Due to this type of defensive behavior, the Animal Encounters staff and I decided to forgo this section of the shaping plan in the effort to prevent injury to trainers.

Initially I had designed phase two to be an introduction to a specific type of touch, to be cohesive with my methods of breaking down the procedure into the smallest steps possible and introducing each of them separately before combining them. However, for the safety of both Penelope and her trainers, this step was not beneficial in the process of shaping behaviors to allow for limited stress. In the finalized shaping plan, Phase 2 will be removed. However, there is potential that in the future and in cases of porcupines housed in

different facilities that this type of training could be effectively achieved. Behaviors that are precursors to aggression can be trained out to some extent with careful monitoring and training where only calm, non-aggressive behaviors are rewarded. Due to the short time period of my project, I did not have the time to dedicate to this type of training, and after discussing this in length with my colleagues we determined the best course of action for our situation would be to progress to the tail tactiles while Penelope is in the squeeze box.

Phase 3:

Phase 3 began on February 19, 2018 and as of writing the final draft of this article, was still ongoing. As of April 16, 21 training sessions had been completed for this phase. We have reached the point of doing tail tactiles with a blunted needle. Meaning the last step after this is tactiles with a pointed needle. Altogether it took 35 training sessions to reach this point.

The first 16 sessions in Phase 3 took place in Penelope's enclosure, the same way the training sessions for Phase 1 and Phase 2 had been. The last 5 training sessions were moved onto a rolling cart that would simulate an environment similar to a vet exam table. A towel was placed over the top surface of the cart and Penelope was released from her transport kennel onto the cart. She was given a few moments to orient herself and explore the cart and then we would begin the training session. She had no issues with the squeeze box being placed over her while on the cart, nor did she show any adverse responses to the tail tactiles while on the cart. In the last 3 sessions of Phase 3, she began to grab the towel covering and pull it into the squeeze box with her which distracted her from the training, as well as her trainers. In the future, we plan to brainstorm different ways to cover the cart that she cannot manipulate as well. At the end of sessions with the blunted needle tactiles, Penelope received a jackpot reward—or an extremely high value reward such as a large piece of dried fruit or a whole, shelled nut. This was to reinforce that her behavior during the training session was spectacular and to strengthen the repeatability of this behavior in the future.

During Phase 3, we did not have the chance to invite any of our veterinary staff to join in on training sessions. The reasoning behind inviting vet staff to attend training sessions and participate in them is to help Penelope become familiar with them and not associate fear situations with them. If veterinary staff are giving her reinforcers while she is in the squeeze box, when it comes time for an actual exam, she will know that its not a situation to be afraid of and that if she remains calm and cooperates she will receive a high value reward. In the finalized shaping plan, I include inviting veterinary staff to attend and participate in training sessions during Phase 2.

Conclusion

Through the implementation of my shaping plan, it was found that a squeeze box is a beneficial tool to reduce stress for the porcupine during medical procedures. Also, the added barrier increased the safety of keeper and veterinary staff. Although some aspects of the initial shaping plan were amended in the final version (Appendix A), it's overall goals were achieved. These training sessions provided the animal with the ability to control its environment and decide to participate in training sessions because she enjoyed the rewards of cooperation.

This shaping plan sets a foundation for future training with Penelope because this shaping plan can be expanded upon to shape behaviors for blood draw procedures in the future. This shaping plan can also be adapted for other mammal animal ambassadors at Lindsay Wildlife so that this type of training can be applied to multiple different species. This shaping plan can also serve to set a guideline for other North American porcupine keepers who are new to injection training with this uniquely adapted species. By publishing this shaping plan publicly, there will be a resource for other North American porcupine keepers that can be easily accessed and referenced.

For an animal ambassador like Penelope, the impact of proper veterinary care that creates as little stress as possible is paramount. However, the impact that Penelope has on the general public is incredibly important as well, as she helps to connect people with wildlife and promote respect for nature. A physically and psychologically healthy animal is one that stands out in the mind of a visitor and allows for a lasting memory to be created that can morph into future stewardship and conservation. The utmost goal of zookeepers is to implement the best possible husbandry procedures that create a physically and psychologically environment for animals in human care. Opportunities where zookeepers can expand their knowledge and innovate new ways to synthesize husbandry practices and positive reinforcement training are incredibly important in the progression of the animal care field.

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APPENDIX A

Subcutaneous Injection Shaping Plan

Written by Anela Medeiros

Goals: Train Penelope to remain calm while in squeeze box and hold still for the duration required to administer a subcutaneous injection to the tail.

Applications: The behavior facilitates subcutaneous injections for vaccines, antibiotics, and anesthetics.

Equipment Needed: Syringes, needles of varying size, blunted needle, squeeze box, tweezers, whistle, mammal handling gloves. Food rewards: yam, broccoli, carrot, dried mango, dried papaya, raisins, raisins, and banana chips.

Phase 1: Squeeze Box

1. Introduce squeeze box during typical training sessions. Bridge¹ with a single whistle and reinforce her for remaining calm when she sees the box or when she investigates the box calmly.
2. Once comfortable with seeing the box, progress to beginning to place box over her. Create a small clear space of floor in her enclosure, use hand targets to direct her to this spot. Use a “down” target to keep her on all four feet.
3. Work on increasing duration in the “down” target position (Work up to 15 seconds)
4. Once “down” target duration is satisfactory, begin introducing a second person into sessions. This second person will act as the “technician”²
5. While “trainer” keeps Penelope in the “down” target position (using hand target and reinforcing with food), “technician” should begin to lower squeeze box over Penelope in small increments, bridge with each increase in proximity. Reinforce Penelope for allowing the squeeze box to be held over her at varying distances.
6. Work up to lowering the entire squeeze box over Penelope. Reinforce for allowing box over her completely for a few seconds, then remove the squeeze box. Ensure that tail is in appropriate position so it will protrude from the squeeze box. Work up to allowing for the squeeze box to be placed over her for a long duration of time (Up to 10 minutes)
7. After Penelope is comfortable staying in the squeeze box for long periods of time, begin introducing the “squeeze” cue and sliding the wooden panel inward in the squeeze box to start limiting Penelope’s squeeze. Bridge and reward if she remains in place and calm. If she begins fidgeting and turn out, release the squeeze, give her a moment, and then give the cue again. As Penelope gets more comfortable with her space being limited by a few inches, increase the distance the squeeze panel is pushed in until the point is reached where she is secured how she would need to be in a vet exam—where she cannot turn around at all. Bridge and reward for remaining calm and not fidgeting.
8. During this process, begin desensitization to equipment needed for injections (syringes, needles, gloves, etc.). Place them somewhere visible to Penelope during training sessions, or show them to her during targeting, or while in squeeze box.

Phase 2: Combining Squeeze Box and Tail Touch

1. “Trainer” should use hand targets to maneuver Penelope to a spot where she can be easily reached (i.e. the floor of her enclosure where furniture has been cleared away). A second person, acting as the “technician”, can then enter the space and join training session.
2. While “trainer” keeps Penelope in the “down” target position (using hand target and reinforcing with food), “technician” should lower the squeeze box over Penelope. Bridge once squeeze box is completely lowered and Penelope’s tail is lined up correctly and protruding from box.
3. With “trainer” at Penelope’s head, “technician” should take spot where they can easily reach Penelope’s tail. “Technician” should be wearing appropriate handling gloves for protection from quills on Penelope’s tail before they proceed with rest of steps.

¹ An auditory cue (in this case, a single whistle) paired (or associated) with a food reward that notifies the animal that the behavior they performed was the correct behavior and that a reward will be given momentarily. This allows time for trainer to pick a proper reward after witnessing the behavior and present it safely.

² “Technician” is the keeper playing the role of the veterinarian during training sessions. The “technician” is someone who Penelope is familiar to lessen stress during beginning of training. The technician does not reinforce behaviors (give food rewards).

4. Press gloved finger to tail (injection site), at first applying no pressure or duration, while saying “touch.” The word “touch” will be used as the cue for this behavior. Bridge using single whistle as soon as finger touches her tail. Reinforce Penelope for not pulling away and/or remaining calm.
5. Incrementally increase the force applied by finger during “touch” cue or the duration the finger is held on the injection site. These aspects should be built independently (i.e. in a session only work on increasing Penelope’s comfort with touch duration or touch pressure, not both). Work toward being able to apply both aspects of “touch” cue together.
6. Once duration and pressure with gloved finger are satisfactory, progress to presenting a syringe to Penelope. The syringe can either have a capped needle attached or no needle attached.
7. “Technician” should show syringe to Penelope and “trainer” should reinforce her immediately once she has seen the syringe. “Technician” can begin desensitization to touching with the syringe. Begin with a short touch of capped needle to tail (only lasting a few seconds) with the cue “poke.” With first few sessions, jackpot³ for allowing the touch. Begin to work on duration by building up to 10-20 second durations of capped needle touching Penelope’s skin
8. Once long duration is established, begin working on pressure of capped needle.
9. Progress onto using a blunted needle, repeat steps 7-8 with a blunted needle replacing the capped syringe. Needle can be blunted by cutting off tip and grinding down edge on a coarse surface. Blunted needle should at no point break skin during this part of the training.
10. Build up duration to 10-20 seconds with blunted needle.
11. Desensitize Penelope to both a quick sharp jab with blunted needle as well as an extended steady pressure with the blunted needle. Do not break the skin! Work on these two situations separately, when each situation is consistently reliable, then combine them. Jackpot for the combined behaviors.
12. When good toleration and duration is built, introduce the real needle. Desensitize to the needle touching the skin, pair with “poke” cue.
13. Once Penelope is comfortable with touch of needle to skin, desensitize to scratching the needle against the skin so Penelope can feel the sharp needle, pair this with “poke” cue. Bridge immediately when the needle comes into contact with the skin.
14. At any point after Penelope is comfortable with steps 1-8, the training location can be moved so that she is on a rolling cart during training session. Being on a cart will be similar to the examination table she will be on during vet exams where injections will be performed.
15. At any point during Phase 2, veterinary staff can attend sessions to help Penelope become more familiar with them and thus learn to not fear them. Allow veterinary staff to perform “trainer” role, so they are building a trust-based relationship with Penelope by rewarding her with food.

³ A jackpot is a type of reinforcement that uses an extremely high value reward. For Penelope this might be a large slice of yam, a piece of dried fruit, or an acorn depending on how long you want her to spend eating. The jackpot is used to associate a high value reward with a behavior that may have been difficult to accomplish.

In utero growth of Nigerian Dwarf dairy goats

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Abstract

Nigerian Dwarf Dairy Goats are a small breed of goats meant for the production of milk, either for direct consumption or to use in making dairy products like butter and ice cream. They are an understudied breed in general and no published studies to determine fetal growth rates have been completed. This information can be used to extrapolate days gestation from fetal size using correlation between fetal measurements and days bred, this can then be used to determine due dates. In this study, a group of pure bred Nigerian Dwarf dairy goats were exposed to bucks during observed estrus and the date was recorded. If the does did not re-enter estrus after 21 days, they were ultra-sounded to check for presence of fetuses. If present, the fetuses were measured from nose to crown and from crown to rump and a rough estimation of area taken up by the fetus and its sack in cm² was recorded. Initial findings are as follows: it is incredibly easy to miss a fetus on ultrasound and the best method for determining the number of fetuses present was to count skulls at days 45-65 gestation. It was also found that measurements were consistent across does who were to be first fresheners and those who had previously kidded, as long as number of kids and number of kids per horn of the uterus were held constant. The discrepancies in size between kids alone in a horn and those who shared a horn were not present until late in the pregnancy. At around 130 days bred those kids who were singles in their horn were found to experience a rapid increase in size

Keywords: Nigerian Dwarf dairy goats, breeding, ultrasound

Introduction

The issue at hand is to determine the growth rate of Nigerian dwarf goats while in utero so that fetal measurements can be used to diagnose fetal age for purposes of pregnancy detection, care of dam and accurate treatment regimens dependent on fetal age. This is an important area for the goat industry/veterinary medicine as nothing is known of the growth rates for this particular breed, which is becoming more widespread in the dairy goat show community and as backyard/urban agriculture settings. The ability to determine gestational age of fetuses via fetal measurements is an excellent aid to veterinarians when advising clients on how best to care for does and the fetuses they carry.

Background and review of the literature

In general, it is known that the gestational period for a goat is 145-155 days, or about five months. We also know that certain markers of pregnancy appear at certain day counts and are not visible beyond a certain day count due to a variety of factors. These structures include cotyledons, fetal bone structure, the amniotic sac, and fetal heartbeat. Features appearing for a short window in the pregnancy include fetal sex, and number

of fetuses present. For the larger dairy goat breeds and for those goats, such as Boers, used for meat, we can estimate gestational age using such measurements as CRL (crown rump length), CL (crown length) and a general area taken up by a single fetus in its amniotic sac. However, these studies do not address the in-utero growth for the dwarf breed of Nigerian goats which are vastly different in other areas of medical importance and are increasing in popularity. This warrants closer, more specific study on this breed as the results will be of increasing use in the years to come, particularly with relation to urban agriculture settings and the farm to table movement.

Rationale

My research question is as follows: what is the growth rate of Nigerian dwarf dairy goats in utero and can those growth rates be utilized to determine gestational age of the fetuses when breeding date is unknown or under question? I hypothesize that the growth rates of this breeds fetuses in utero can be used as a reliable indicator of gestational age when applied as an average. This will show that proper diagnoses of stage of pregnancy can be made using ultrasound techniques in the Nigerian dwarf goat.

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Method and design

Data was collected by use of a transabdominal probe style ultrasound using human grade lubricant via the surgically clipped right flank/under flank area of buck exposed Nigerian dwarf dairy goats on a semi-regular basis. This method was chosen to reduce animal stress, time needed to obtain measurements, and ease of use for personnel. A selection of does which have had their ovulation cycles synchronized will be used, they will be from the same herd, receiving the same feeds, living in the same conditions over the course of the study. After the study they will be returned to their lives as show goats and family milkers, where they will be treated according to industry best practices for the remainder of their natural lives, barring such an instance as they are sold to another appropriate home or must be euthanized due to illness, disease or injury which cannot be reasonably treated with the help of a veterinarian.

Results will be analyzed with the use of graphs and data tables. An extreme outlier would disconfirm my hypothesis as the growth rate would be shown to be inconsistent among does in the study group. All other options would confirm my hypothesis.

Significance

This study will lead to better medical care and management of the Nigerian dwarf goat, allowing them to be more productive over their lifespan and produce a higher yield of viable kids per doe at a lower cost per head. It will also lead to higher quality of life for does (known pregnant does are not stressed by unnecessary rebreeds) and a lower kid mortality, as known days bred gives a due date, thereby allowing a human to be present at parturition at a higher frequency than if due date is not known. This leads to better disease prevention, namely CAE and CL prevention protocols where kids must be removed from dams at time of birth to decrease the risk of transmission via infected colostrum.

Results

My results are a linear growth pattern while fetuses are in utero over the 5 month gestation period. My results are listed in the tables and accompanying graphs below, as well as each having a narrative explanation below the associated graph.

Discussion

For this study 10 does were exposed to bucks during their estrus cycles, however only 4 of them settled and freshened by the end of the study period. This low rate of successful breeding could be attributed to many things, such as inconsistent personnel

monitoring of the chosen does for signs of estrus, silent estrus and breeding either too early or too late in the estrus period. Figure 1 shows an interesting phenomenon that may be an indicator of very early pregnancy in the Nigerian Dwarf, fluid filled pockets were observed in the uterus. It was postulated that they may be a kind of follicle or cyst, but the position and clarity of them eliminated that possibility. They were observed to be grouped together and may be the beginning of implantation or another early process of pregnancy. However, of the two does which had these fluid filled pockets one had four kids, and one had only one kid, therefore these fluid pockets cannot be used to predict number of kids in the litter. Also, only half of the does in the study were observed to have these fluid filled pockets, but it is possible that they were not scanned at the ideal time and the pockets were missed.

In Figure 2 we see that there can be a centimeter of variation between fetuses which are the same gestational age in different does. This could be accounted for in a mere 12 hours difference in breeding. To substantiate this further study would be required. However, there is a strong correlation between days bred and CRL, making it an ideal way to estimate within a few days the fetuses gestational age, which can then be used to determine a due date for the pregnancy.

In Figure 3 we see the same data, but in a graph, showing the linear growth pattern which makes it so easy to see the correlation between the days bred and crown to rump length.

In Figure 4 we see the same pregnancies represented at 79 and 64 days bred, but the measurement is head length. The reason that this measurement is added at this point is that it can be difficult to obtain a clear CRL as the fetuses grow and overlap each other.

In Figure 5 we see the same measurements from Figure 4, this time in a graph showing a very clear linear relationship between the measurements and days bred and a remarkable consistency between does, with both having fetuses that measure exactly the same when compared to the same days bred. This could be indicative of a highly conserved nature in head development that ensures the fetuses are developing their brains and central nervous systems. Further study would be needed to solidify these new questions and provide answers for them.

Figure 6 shows the same gestational point as Figure 4 and Figure 5, but the measurement is crown to rump length. We were lucky enough to catch the developing kids in a 'sunbathing' position, where they are mostly stretched out in the uterus and can be measured this way. Here we do see a centimeter's difference in the measurements for does that share a breeding date. We can also see in comparison to Figure 2 that the larger measurement now belongs to the opposing doe, suggesting that there is some individual difference in the

rate at which fetuses grow in this dimension; this could be due to genetics or could be operator error in measuring.

In Figure 7 we see the graphical representation of Figure 6, which illustrates just how close the measurements are and how they are stacked on each other in relation to days bred.

In Figure 8 we see the measurements of the girth, which was measured on one side of the fetus from shoulder to point of elbow, as we can see there is a difference of more than double in the time frame between 54 and 79 days bred.

Figure 9 shows the linear relationship of that growth, making it an excellent measurement for determining days bred in mid to late pregnancy.

Conclusion

This study is the first of its kind on the Nigerian Dwarf Dairy Goat, and thus needs much repetition with larger cohorts of does in multiple herds included. For now, it can be used as one tool in the veterinarian's toolbox to give a gestational age for pregnancies within this breed. I would also like to see it done at more frequent intervals for richer data; this would be an expensive undertaking as it would involve having an ultrasound machine on site for ease of use. My veterinarian didn't have time to come out as often as either of us would have liked, and as a result my data is sparse. For best results I think scanning every 2 weeks starting at 25 days post breeding would be sufficient. I hope to continue this study doing exactly that when I get to vet school after obtaining a masters degree.

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Fluid Pockets in Uterus

12/1/2016				
Doe Name	Days bred	Status	# of kids	Measurements
Ivy	39	0	0	
Basil	53	0	0	
Delilah	53	0	0	
Esmeralda	25	1	4	Fluid pockets-4
Darla	25	0	0	
Harmony	25	0	0	
Brooke	25	1	4	Fluid pockets-4

Figure 1: This table does not have an accompanying graph, as it is an unexpected piece of data that came out during analysis. Two does were seen to have fluid pockets in their uteruses at 25 days bred

Crown-to-Rump Length: 38 or 63 Days Bred

1/17/2017				
Doe Name	Days bred	Status	# of kids	Measurements(CRL, cm)
Brooke	63	2	1	8
Esmeralda	63	2	2	9
Ivy	38	0		
California	38	0		
Carolina	38	2	1	3
Emily	38	2	3	2
Darla	63	0		
Briar	38	0		

Figure 2: These are measurements of the crown to rump length of kids whose dams are 38 or 63 days bred.

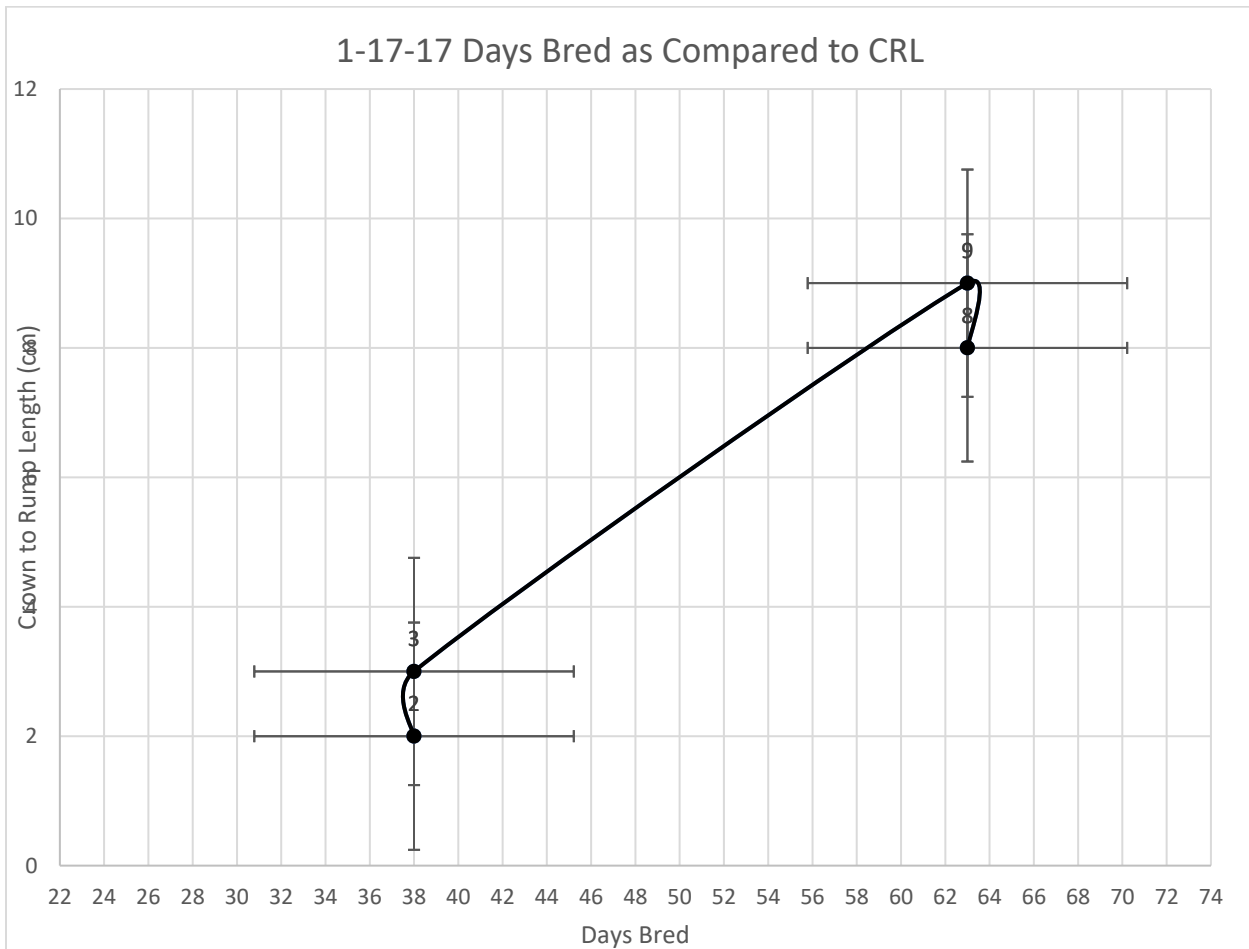


Figure 3: The same data as Figure 2, graphed as crown to rump length vs days bred.

Head Length

2/4/2017				
Doe Name	Days Bred	Status	#of kids	Measurements (Head Length, NC, CM)
Brooke	79	2	1	5
Esmeralda	79	2	3	5
Carolina	54	2	1	2
Emily	54	2	3	2
Harmony	34	0		
Basil	27	1		

Figure 4: This figure shows the head length (tip of nose to crown of head) of measurable kids for each of 4 does either 54 or 79 days post breeding.

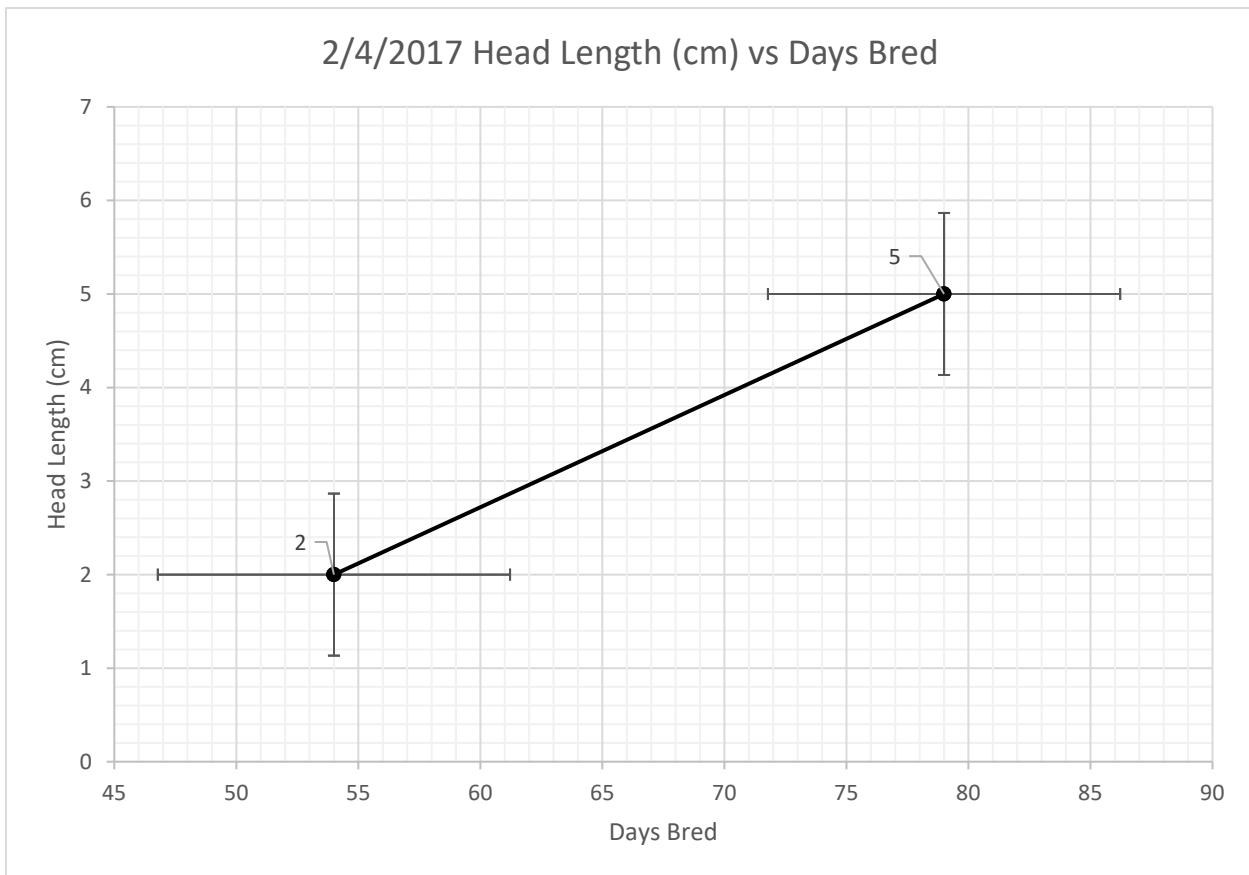


Figure 5: A graphical representation of Figure 4, showing head length as measured from tip of nose to crown of head.

Crown-to-Rump Length: 54 or 79 Days Bred

2/4/2017				
Doe Name	Days Bred	Status	#of kids	Measurements (CRL, cm)
Brooke	79	2	1	14
Esmeralda	79	2	3	13
Carolina	54	2	1	6
Emily	54	2	3	7
Harmony	34	0		
Basil	27	1		

Figure 6: Table of values showing crown to rump length of fetuses in does 54 or 79 days bred.

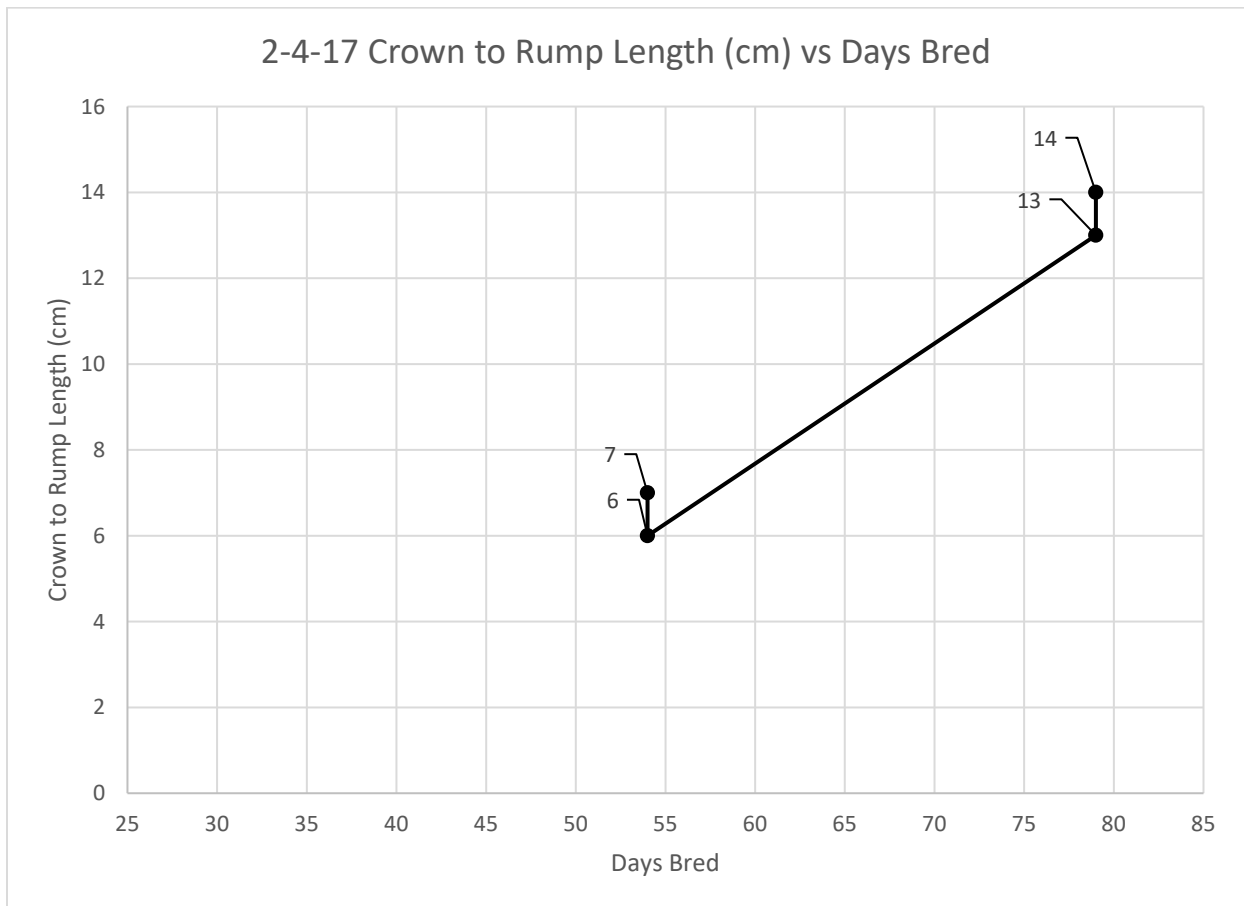


Figure 7: a graphical representation of the data in Figure 6, showing the measurements of CRL in fetuses of does 54 or 79 days bred, with two of each respectively.

Kid Girth

2/4/2017				
Doe Name	Days Bred	Status	#of kids	Measurements (Girth, cm)
Brooke	79	2	1	5
Esmeralda	79	2	3	5
Carolina	54	2	1	2
Emily	54	2	3	2
Harmony	34	0		
Basil	27	1		

Figure 8: Table showing the girth in centimeters of measurable kids of does either 54 or 79 days bred.

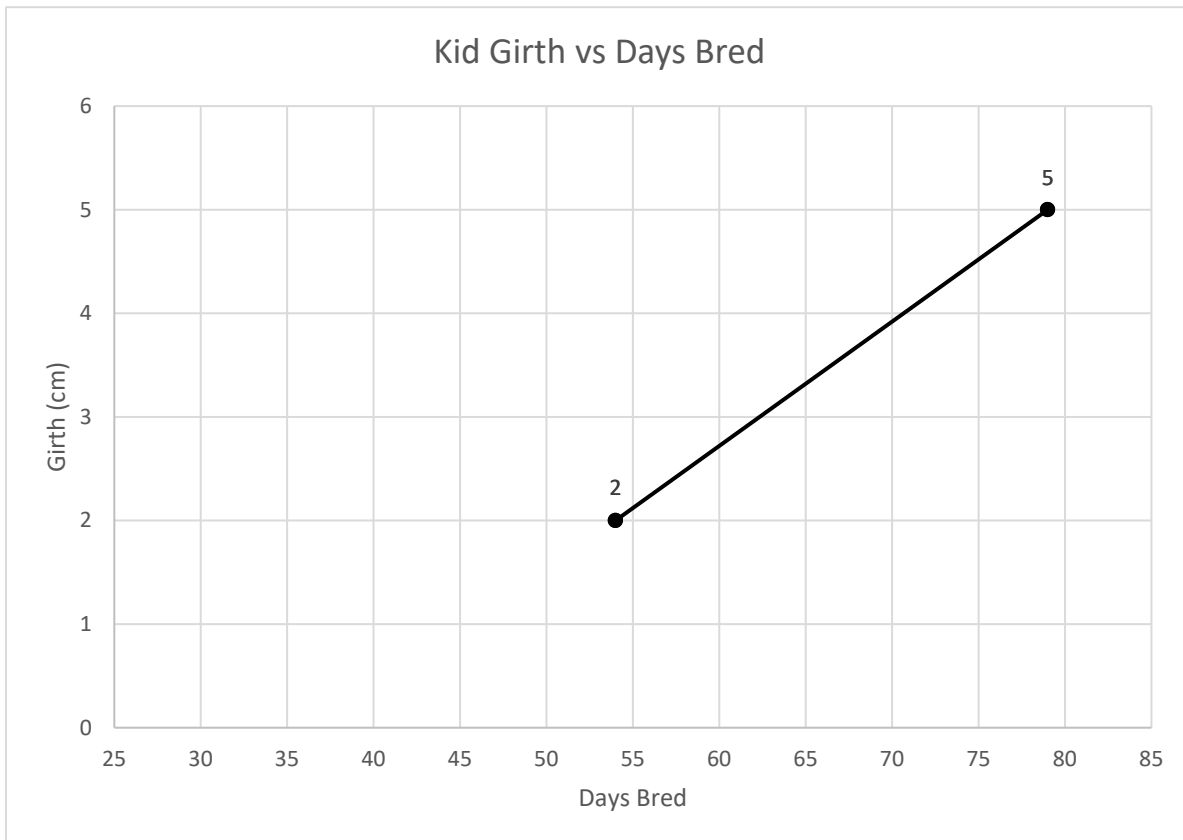


Figure 9: A graphical representation of the girth of fetuses of does either 54 or 79 days bred.

An environmental internet of things solution for wild pig tracking

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Abstract

This purpose of this paper is to propose a way to track wild pigs in California, a species that causes millions of dollars in damages throughout the state each year. Using the methods involved with the Environmental Internet of Things (EIoT), better data could be obtained regarding the pigs, thus allowing for better policies in managing these animals. Based on its use in several other countries, such as China, the data collected using this system is of a higher quality and therefore more useful. The monetary costs of the system are also explored and weighed against the costs in damages caused by the pigs. This paper concludes that, though expensive, the Environmental Internet of Things would help wildlife managers create more effective policy for managing wild pigs.

Keywords: EIoT, wild pigs, environment, computer science

Introduction

In the world of animal ecology and management, wild pigs, or *Sus scrofa*, offer a unique problem. In California, for instance, wild pigs and European boars (which are usually grouped together in discussions) are an exotic and invasive species that presents many problems to California's ecosystem. Wild pigs cause a lot of damage in both wildlife habitats and agricultural areas of California, causing millions of dollars in damage and a loss in the state's biodiversity (Melstrom, 2014). Wild pigs are opportunistic omnivores, meaning that they will eat almost anything, and are known by farmers to root up fields and consume mast, which makes them a conservation concern (Wilcox, Van Vuren 2009). Wild pigs are, therefore, a great danger to the ecosystem of California, and the problems will only be magnified as the pig population grows. It is important, then, that wild pigs be tracked and observed in an effective manner so that policy on management, i.e. how many pigs hunters are allowed to take, can be made in an informed manner. By implementing the Environmental Internet of Things (EIoT) in wild pig ecology, greater quantities of high quality data can be obtained in order to make better decisions on how to manage wild pig populations.

Why wild pigs?

I've specifically chosen wild pigs because of how prolific of a species they are and because they cause so much damage to both the ecosystem and economy of California. They are a very numerous species, with

females having multiple litters per year (Wikipedia – Wild Boar). These litters can range in size from 6-8 all the way up to an observed maximum of 10-12 (Wikipedia – Wild Boar). Wild pigs will eat pretty much anything, and are considered predators in the oak woodlands of California (Wilcox, Van Vuren 2009). One must also note that, “wild pigs do not possess shearing cheek teeth, so vertebrates they consume are crushed and swallowed whole...” (Wilcox, Van Vuren 2009), so they can eat most small mammals and the infants of larger mammals with relative ease. Jeffrey Wilcox and Dirk Van Vuren performed a study to see what it was that pigs ate out in the woods, and came to the conclusion that wild pigs could be considered predators in their habitat. To quote their study they, “...focused exclusively on vertebrate prey in pig diets to describe the frequency and diversity of vertebrates consumed, and to determine if the rate of vertebrate consumption varied according to season, sex, or physical condition of individual pigs...” (Wilcox, Van Vuren 2009).

The data they obtained over this seven-year study showed that much of what the pigs ate included not only the usual plants, mast, and earthworms that they would dig up, but that these pigs ate many birds and mammals (Wilcox, Van Vuren 2009). Of the approximately 107 stomachs that Wilcox and Van Vuren looked at, they found 158 mammals, 5 birds, 3 reptiles, and 1 amphibian (Wilcox, Van Vuren 2009). The data shows that pigs really will eat anything and everything if need be, though the bigger issue is the fact that it was other vertebrates they were feeding on. In particular, two specimens of *Odocoileus hermionus*, or Black-Tailed

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Deer, were found in the contents of their stomachs (Wilcox, Van Vuren 2009). This presents a problem, as deer populations have been falling as of late (Deer – CDFW), particularly due to increasing populations of black bear and cougar, and adding pigs to the equation, even at such a small rate with regards to the experiment, means that deer populations will suffer even more due to predation by wild pigs.

Wild pigs also cause much agricultural damage in California. Wild pigs will prey on different farm animals, such as lambs, full-grown sheep, kids (baby goats), and calves (How to Manage Pests). They also root through soil in order to find different plants, and this, along with their wallowing, foraging and hunting behavior has caused a roughly 6-10% loss in revenue in varying commodities (How to Manage Pests). Wild pigs are also extremely expensive and difficult to get rid of, as shown by the Santa Cruz Island eradication, which costed \$5 million and lasted 26 months (How to Manage Pests).

Wild pigs are a nuisance and cause much damage to California's agriculture and ecosystem. The adverse effect that they have on the state indicates that they need to be better managed. So how can we use the EIoT to better manage them?

What is the Internet of Things (IoT)?

To begin with, what is an IoT? An IoT is, “a network of physical devices embedded with electronics, software, sensors, actuators, and network connectivity which enable these objects to connect and exchange data” (Internet of Things – Wikipedia) . The Internet of Things, “provides a network of sensor- or radio-connected devices that can be uniquely identified and located in the cyber-physical space...” (Hwang, Fox, Dongarra 2012). This allows the IoT to be used in a multitude of settings. An easy way to visualize the IoT is waking up in the morning and having your phone send a signal to your coffee pot to make coffee. It's essentially a network of devices (or “things”) that send signals back and forth to one another and work together.

Using the EIoT, which is the IoT but applied to an ecology setting, could make gathering this data an easier process. Tracking pig populations is incredibly difficult, and it's hard to make decisions on how to manage them without good data. Engeman, Massei, Sage, and Gentle state that, “The management of wild pig populations or the mitigation of their impact often requires knowledge of local abundance information...” (Engemen, Massei, Sage, and Gentle, 2013). There are several techniques for tracking wild pigs that are currently used, as with any animals, such as Argos Doppler tags (electronic tags that send periodic signals to Argos transmitters on polar-orbiting satellites), GPS tags (which calculate the location of an animal at specific time intervals using

positions estimated by a network of satellites), and VHF radio tags (tags that emit a very high radio frequency signal that can be used to locate the animal (Movebank)). Other techniques such as trail cams and RFID chips in tags are used as well (Rice, Kucerra, Barrett 1995). By using the EIoT, these methods can be combined to gather data such that managing these animals can be done much more effectively than with just the aforementioned conventional methods by themselves. Implementing this technology may be expensive however, as implementations have cost other organizations, such as US Law Enforcement costed roughly \$70 Thousand (Klubnikin 2016). The use of this technology in other countries for similar purposes (and to great effect) indicates that the cost of implementation is well worth it.

The Internet of Things (IoT) as a whole has been applied to the ecology of many species already (Songtao, et al. 2015). Further, Li et al. (2015) found recent advances with the IoT have made the methods and technology better for protecting and conserving nature reserves. The evidence points to the IoT's effectiveness, especially in the types of habitats that pigs would be found in. Applying this technology could help scientists get a greater quantity of data and getting this data could help influence the policies on how pigs are dealt with in California, be it bag limits for hunters or policies on depredation. Better quality data such as herd sizes and ranges of movement, among other things, will allow the California Department of Fish and Game better capacity for decision making, and thus conservation of California habitat could be more effective.

The Cost of an EIoT Solution

As previously mentioned, the biggest drawback to an internet of things solution is its cost. Current methods of tracking animals are rather costly, with hardware costs being lumped in with wages paid to those who would have to actually tag the animals. For reference, Estuarine Crocodiles in Australia have costs of \$2200 for the transmitter and another \$1170 for the boat/capture crew (Robertson, Holland, Minot 2011). If this is any indication, the cost of tagging wild pigs is rather expensive in and of itself.

However, it is not only the hardware and wages that one would need to take into account when building an EIoT solution. According to Andrei Klubnikin, roughly 20-30% of the budget for an EIoT would go into the software (Klubnikin 2016). As previously stated, for a large project taking around 2000 man hours to develop, the cost is roughly \$70000 (the cost the FBI paid just for the application they could use for their EIoT). Due to the fact that increasing complexity in an EIoT will increase its cost, the final price would be rather hefty.

Let's say that the amount paid by the FBI for their software (\$70000) was 10% of their budget. By that estimate, the total cost of implementing the EIoT solution alone (hardware, software, middleware, etc.) was \$700000. This is obviously a large sum of money, but this solution was made only for FBI agents at sites where there was possible radioactive contamination (Klubnikin 2016). The hardware costs for an EIoT solution in California would most likely far exceed those used by the FBI. The final cost of implementing an EIoT solution in California for the tracking of wild pigs would then likely be in the millions.

While this is an expensive sum, and one that would be funded by taxpayer money, the amount the state would pay in order to finance this solution would be a pittance compared to amount paid in damages. While the short-term cost of an EIoT solution is high, the benefits are worth it in the long run.

Conclusion

In conclusion, pigs represent a major problem for California, as well as the rest of the United States. Nationwide, they do, as a conservative estimate, \$1.5 billion in damages to the environment and agriculture (How to Manage Pests). Not only this, but they prey on many species and often outperform species that are endemic to a habitat (Melstrom). By using the EIoT and its techniques and technologies, better decisions can be made on how to deal with wild pigs, whether those decisions are lowering the hunting done on them (this will likely never occur) by making tags more difficult to obtain, increasing hunting by lowering tag prices, or full on eradication of the species in certain areas.

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The Streets are Uneven: The Manifest Disparity of the Meanings of Being

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Abstract

Martin Heidegger has taken up an investigation of the meaning of Being (existence) and has carefully arranged this exposition in his work *Being and Time*. Such an investigation begins with the exposition of *Dasein*, the being that can investigate its existence. This appears to be the nickname for humanity. While investigating its proper existence, *Dasein* can be lead astray and fall into the being of *They*. The *They* is Heidegger's appeal to coexistence. *They* have their being localized and accounted for, there are no surprises when it comes to *them*. Heidegger claims that the *They-self*, into which *Dasein* can slip, can lead to a loss of traction on one's own existence. The implication seems to be that when *Dasein* engages *Them*, the meaning of its proper existence is at stake, in danger of being lost amid the ubiquitous nature of *They*. What is the nature of this meaning, and if lost can it be recovered? Following these expositions, we will (re) gain the meaning of Being as both utterly private and unexpectedly public.

We turn our attention to the writings of Jean-Luc Nancy (*Being Singular Plural* and *Sense of the World*) to critique Heidegger's lamenting of the loss of the meaning of Being and determine whether or not these lamentations are out of place. Nancy does away with the notion of authenticity and replaces it with the plurality of Being. In this new discourse concerning existence, not exclusive to humanity, the meaning of Being is had in the communication between entities in the world. All of Being then has a share in circulation of meaning as a relation from the I, myself, to the door leading to the other side of our existence, to our coworker and every entity in between.

From this we can conclude that we must remain open to the possibilities of communicating our existence to others, receiving theirs in turn, in order to gain a newfound appreciation for the incredible flux of Being before us. Such communication, however, commands that we account for the distance to be covered in our communications. We must be cognizant of our position in relation to the plurality of Being and the way in which we engage in circulating meaning to the existents that come to make up our world. Such a relation, born of the union of Heidegger's notion of authenticity and Nancy's proclamation regarding the plurality of Being, is one of constant work. We must account for the manifest disparity of the meanings of Being, taking care to communicate with a greater range of existences, some at our human capacity like the friend from work and others at their own levels like the lemon tree blossoming in the neighbor's yard. As such, assuming our place within the plurality of Being and likewise communicating with other existences, we will stay grounded in our own existence which is itself part of the great flux of all Being. Resulting from our being grounded in the Plurality we will happen upon things that escape our apprehension or seem base to us but these will only further reinforce our relation to our proper place in the Plurality of Being. At such a juncture we must familiarize ourselves with this, our place in relation to others, and remember "people are strange when you're a stranger" and "the streets are uneven when you're down".

Keywords: Heidegger, Nancy, Being

Introduction

I woke up this morning to the dreadful din of my own existence. I've written and rewritten this statement countless times, toiled over its meaning likewise. It certainly doesn't help that I am afforded no direction, no reprieve, and--most of all--no assurance from either myself or the world where I find myself. There's a lingering, or perhaps festering, discomfort in my inability to confront my existence and make heads or tails of it. No one ever told me it would amount to such insidiously crushing despair but, I guess, it was also plain enough to read on their faces. They hounded me in my youth: "Don't be afraid to be yourself!" and then,

when I began to be myself they scolded me yet again, "Not like that, you idiot, no one knows what you're talking about!". I've thrown my hands up, refusing to show any measure of authenticity knowing that I will be reprimanded in the most suiting fashion.

What I was able to observe, perhaps even early on, was that this demand for authenticity came with a list of acceptable parameters. One is allowed to deviate from the vague and average way of being but only in such and such a manner, "in the way that Jimmy is doing it--see there, do it like that". No, you can't be yourself; people will see you, and then they will judge you for not being like them. "Hey, Nancy, is that kid reading Bukowski?" "I say Shirley, he must be, it says so on the spine of the

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book.” “That’s not Shel Silverstein! Let’s tell on him.” They will run you down, tie you up, cram you into a pigeonhole and baptize you as acceptable. Maybe you can’t tell because your pigeonhole has no windows.

Now, in the dark, where you can’t see what’s different, everything is stable—occult, but accounted for. And that’s right where they want you, right where everything is within reach: “It will be better this way, you’ll thank us later in kind,” They say to us all. It would be wise not to ask questions—They have answered them all! No more of those pesky questions that just eat up your time, e.g., while you’re trimming your toenails, “What am I doing?”, or as you are pouring coffee into your thermos for another lukewarm Wednesday at the office and accidentally spill a drop on the toe of your shoe, “Why am I doing this?”. Those answers are given by the bounty! You trim your nails because no one else has nails that go out an inch-and-a-half, you take your coffee to work in the nifty little thermos you found in this month’s *Better Home and Gardens*. You think to yourself, “Oh that’s so cute, that’s so you!” that’s what They’ll say”. With resounding confidence, you pick up the phone to mark the number and order THERMOS 60091.

Wednesday rolls around, it’s boardroom meeting day. Today, things will be different, everyone’s eyes will be drawn to your thermos. You can hear the accolades now, “That’s so charming,” “It really suits you,” and then your boss takes you aside, “Hey, great thermos, know where I can get myself one of those?”. As you walk into the boardroom everyone is seated, murmuring to themselves as they frantically swipe their phone screens, and clearing your throat as you sit down, everyone looks up wide-eyed, gasping “How absolutely cute!”. Steven, your coworker, bought the exact same thermos as you. So much for leaving a mark on this Wednesday bored-room meeting.

It turns out that you are not the only one who wanted to impress the office with a thermos. There is no harm in that. It also turns out that Steven bought the same thermos as you. What’s up with that? Now everyone will think you just copied Steven. You can hear the voices now, “You inauthentic piece of human garbage, you know we all love Steven and you copied him so that we would accept you”. They are right. They always are. There was no telling about Steven, but the thermos was bought with the hope that They would love it. But why should we care about being accepted by Them, on the one hand, and on the other, that Steven has the same thermos?

The answer to these questions have, as their common linchpin, the notion of authenticity. As regards the thermos, the fact that Steven has the same one

dismantles the novelty of your own. The thermos no longer says, “Look at *who I am*” but rather, “Look at *who Steven and I are*”. And insofar as the thermos now speaks to a shared identity, it is no longer a singular expression of the way you take up drinking coffee as one of your authentic possibilities of existence. The question that requires a little more thought is that of seeking Their acceptance. We seek to be accepted by Them insofar as being accepted gives us the liberty to then deviate from Their vague and average ways of doing things and incorporating them into what makes our existence uniquely our own.

Heidegger: Misgivings concerning being

Martin Heidegger provided an answer to the question concerning the appropriation of one’s own existence. In his work *Being and Time*, Heidegger systematically answers the question of what it means to authentically take up one’s existence. Such an exposition begins with a reopening of the question of the meaning of Being. As Heidegger claims, this is one of the most overlooked questions in philosophy, in particular, and existence in general. Being must then be interrogated in order to locate its meaning. This process will necessitate an interrogation of beings, as different manifestations of Being, in order to obtain a common and unifying theme. Such an interrogation, however, cannot indiscriminately go from being to being in order to ask about the meaning of Being. Through a somewhat laborious process, which we will investigate in greater detail below, Heidegger names the one being to be interrogated: Dasein. This being is the only one that can reflect on its existence, ask itself about its existence and the modes in which it takes it up; Dasein, effectively, is the only being which can relate to its relation to existence. In its relation to its existence, confronting it, overcoming it, making it its own, Dasein becomes an authentic being, distinguished from the others, the *they*. We shall analyze exactly how such a relation can come about, in what ways this manifests, and the existential import of such relations.

Heidegger provides three prejudices, or perhaps misgivings, that would justify a reawakening of the question of being. The first reads “Being is the most ‘universal’ concept...If one says accordingly that ‘being’ is the most universal concept, that cannot mean that it is the clearest and that it needs no further discussion. The concept of ‘being’ is rather the most obscure of all”¹. Precisely in this universality of the concept of being lies the linchpin of the problematic Heidegger is here addressing. Insofar as *being* is universal, it is understood everywhere, e.g., the statements “the cat is black,” “the

¹ Heidegger, Martin. *Being and Time*. State University of New York Press, 2010. p. 2

room is dark,” “here is the cat,” express a relation to the existing world. What is the relational import of the *is*, that conjugation of *being*, that we so readily pronounce; in pronouncing it do we account for the existential import of having a relation to other existing things in the world or do we merely pronounce “this is boring”? In anticipation of the latter, Heidegger proclaims the obscurity of *being* as what is most glossed over in quotidian existence. This glossing over is indeed influenced by the indefinability, and perhaps the inexhaustibility, of the concept of being.

The second prejudice Heidegger cites regards the indefinability of being. “The concept of ‘being’ is indefinable,”². It is further maintained that *being* cannot be understood through some higher conceptual definition nor through examples. This prompts the conclusion “that ‘being’ [‘Sein’] is not something like a being [‘Seiendes’]. Thus the manner of definition of beings which has its justification within limits--the ‘definition’ of traditional logic which is itself rooted in ancient ontology--cannot be applied to being,”³. We cannot come to know *being* through any concept of it, for to say “*It is...*” would presuppose an understanding of being in order to express the concept. Accordingly, *being* is unlike a being inasmuch as we may define a being according to a concept, e.g., a particular book is subsumed under the concept of “book”, a particular dog is subsumed under the concept of “dog”, but we cannot define *being* according to a concept because it escapes definition due to the disparity between the beings of various kinds. “The indefinability of being does not dispense with the question of its meaning but rather forces it upon us”⁴. This indefinability is indeed intimately bound up with the universality of the concept. The fact that it is to be found everywhere but resists definition creates a certain tension that needs to be resolved.

The third prejudice regards the self-evidence of *being*. “Being” is used in such an average way that it appears to warrant no further discussion. In the examples I have cited above, the expressions regarding the cat, the room, books, and dogs are all readily comprehended. The fact that such statements are comprehended so easily, Heidegger argues, betrays the manifest incomprehensibility of *being*. “The fact that we live already in an understanding of being and that the meaning of being is at the same time shrouded in darkness proves the fundamental necessity of retrieving the question of the meaning of ‘being’”⁵. Given that there is an average comprehensibility of being that founders

when interrogated, Heidegger ventures forth to quell the disquiet of this average understanding of being.

Heidegger: Plumbing the depths of Dasein

Heidegger defines the parameters for his investigation of the meaning of being as, “Insofar as being constitutes what is asked about, and insofar as being means the being of beings, beings themselves turn out to be what is interrogated in the question of being. Beings are, so to speak, interrogated with regard to their being.”⁶ It is clear that to find out the “meaning of Being” an investigation of beings must be launched. Heidegger also notes the difference between “Being” and “being/s”. There are different relations to either: the former is the infinitive “to be”, such as the human’s relation to its existence, and the latter is the definitive “being”, where a human is a being because it *is* something existent in the world.

To investigate Being (the infinitive), Heidegger indicates *Dasein*, the congregate of the German “da-” meaning “there” and “sein” meaning being (the *there-being*), as the one existent who questions its being, and can thus be made transparent in its being. This term also translates to “existence”, particularly and exclusively *human* existence. This transparency would effectively get rid of any confusion to be found in the investigation of Being. In fact this transparency of Being is underscored by Heidegger’s notion that “Beings can be determined in their being without the explicit concept of the meaning of being having to be already available.”⁷. This makes *Dasein*, in Heidegger’s ontology, the apposite being to “interrogate” about Being because of its ability to question its being *in conjunction* with the idea that the “concept of the meaning of being” can be disclosed after the appropriate amount of investigation through a being.

This may however pose a problem for an ontological investigation since *Dasein* is “ontologically what is farthest,”⁸—we are *Dasein*, the “there” where *our* being is found. Before we can arrive at a comprehensive understanding of our own being, we must wade through the many articulations of being that are not our own. We understand ourselves in terms of “there”; our being always lies outside of ourselves. “Dasein tends to understand its own being in terms of *the* being to which it is essentially, continually, and most closely related—the ‘world,’”⁹. *Dasein* is equipped to interrogate Being because it is able to separate itself enough from its own being—placing it “there”, “in the world”, instead of the immediate “here”. *Dasein* lacks

² Heidegger. op. cit. p. 3

³ *ibid.*

⁴ *ibid.*

⁵ *ibid.*

⁶ Heidegger. op. cit. p. 5

⁷ Heidegger. op. cit. p. 7

⁸ Heidegger. op. cit. p. 15

⁹ *Ibid.*

the immediacy of Being to the extent that it can put its own being in question without threatening its integrity.

The “world” through which Dasein understands its being, Heidegger calls the *They-self*, put differently, we understand ourselves in the everyday roles of being that we are “assigned”, the mode of being that is imposed on Dasein before separating itself from the Crowd. This imposition seems to jeopardize Dasein’s own being. Heidegger claims, “This being-with-one-another dissolves one’s own Dasein completely into the kind of being of ‘the others’ in such a way that the others, as distinguishable and explicit, disappear more and more.”¹⁰ In our everydayness, we sink into the *They-self* and lose whatever semblance of a grip we had on our own Dasein, our own being, and can only distinguish it from the *They* with an increasing amount of effort corresponding to our submergence in the *They*.

Morin addresses Dasein’s interrogation of being, further underscoring the existential dilemma of human thought: to find the meaning of existence. Heidegger names Dasein as one of the three constitutive elements of world; Dasein, handy thing, objectively present thing, and the relations between them “make up” the world, according to Heideggerian ontology. This conception of world appears to be Dasein-privileging. The world, according to Heideggerian ontology would then be born of Dasein’s confrontation of it, i.e., Dasein using handy things, walking blithely past what is objectively present, and mapping out the relations between the different entities constitutes the phenomena of *world*. This account of the world, as a static web of interrelation between existent entities, is one that allows Dasein to build meaning into its existence. This is how existence, and the relation to it, will *matter* for Dasein and allow it to make sense of itself on the stage of Being that is *world*.

In the Heideggerian conception of *world*, an ontological account is given of humanity and the ready tools it uses to take care of its existence, such as the hammer for building shelter. Perhaps it is appropriate for Heidegger to exclude animals and inanimate objects that aren’t “tools” in his ontological account, such as the lizard or the couch. These things do not exist in the way that Dasein exists, for “That Dasein exists means that while it is and each time that it is, its being is a task or an issue for it, something it has to take over in one way or another,”¹¹ Dasein has to confront its existence but this is not something it can readily do. Dasein has to

“take over” its existence, make it its own, and affix its signature to it. Dasein interrogates being by way of deciding on how it will take up its responses to its world. This has no ready answer.

Because Dasein is a being that is already so far along on the path to having the “explicit meaning of [its] being” available, by questioning the meaning of its being, Dasein has the ontic priority to uncover the meaning of Being. The priority Dasein holds is only in effect as long as Dasein is the only being capable of interrogating Being in the Heideggerian account. If, say, a duck were to be acknowledged as a being, it would also be capable of uncovering the meaning of Being. This is, however, not the case with Heidegger’s anthropocentric ontology that seems to privilege human cognition as Being. This is a yet greater Heideggerian critique being hashed out elsewhere and in much greater detail.¹² The anthropocentricity does begin to explain Heidegger’s smattering of an appeal to the being-with.

In Morin’s analysis of “Nancy’s rewriting of Heidegger’s *Being and Time*”, she asserts, “According to its inner constitution, it is impossible for Dasein not to relate ‘meaningfully’ to entities,”¹³. Insofar as the Dasein’s world is made up of the relations between itself and the handy or objectively present things that serve to promote the security of Dasein’s existence, Dasein *must* relate meaningfully to entities. Dasein, as a being that *can make* meaning of its existence (and therein its relations to other existences in the world), must engage its world in a manner that allows for the meaning of its existence to appear through these relations. Morin’s decisive use of “entities” in the place of “beings” must be noted here. Heidegger, though he calls them “innerworldly beings”, does not allot these—to use Morin’s phrasing—“entities” a place within Being. Although these entities are excluded from being, they nonetheless help Dasein in its attempt to uncover the meaning of its existence. As these beings are indeed in-the-world, yet in a manner *unlike* the way Dasein is in-the-world, Heidegger pronounces them as “innerworldly beings”.

“Innerworldly beings” are instead relegated to the realm of relevance. These are things that are relevant to the maintenance of Dasein’s existence, e.g., the hammer, the stove, the tire iron, etc., and are determined in their being to remain as such.

“Relevance is the being of innerworldly beings, for which they are always initially freed. In every instance,

¹⁰ Heidegger, op. cit. p. 123

¹¹ Morin, *Jean-Luc Nancy*. Polity Press. 2012. p. 23

¹² Froese, Katrin. *Nietzsche, Heidegger, and Daoist Thought: Crossing Paths In-Between*. State University of New York Press. 2006. In this work, Froese, similar to Nancy (seen later), opens up the discourse concerning being to the *vague* and *average* understandings that all humans have about Being. In such an openness, the focus lies not on carving an individual identity, as is

the case with Heidegger but rather, borrowing from Laozi and Zhuangzi, on a celebration of others. This enables human beings to become “joyful wanderers” in the scene of Becoming. Both Nietzsche and Heidegger give voice to the critical tension between self-creation and an over enthusiastic egoism that leads to a “mastering” of the world in the stead of allowing the world to be precisely what it is, i.e. part of the incessant flux of Being.

¹³ Morin. op. cit. p. 23

innerworldly beings have relevance. That they have a relevance is an *ontological* determination of the being of these beings, not an ontic statement about beings.¹⁴

As an ontological determination of beings, relevance plays a crucial role in the being's relation to its being. Innerworldly beings exist for-the-sake-of Dasein, to help Dasein take care of itself and secure its existence. Because Heidegger makes relevance an ontological determination of these beings—determinations that shape the nature of how entities exist in the world—and not an ontic statement—one concerning the being of beings—he strips the innerworldly beings of Being, making it exclusive to Dasein, which only further emphasizes Heidegger's anthropocentricity.

This critique of anthropocentricity further underscores Heidegger's foundationalist ontology. Dasein is the starting point of Heidegger's ontology, it is Dasein upon which "world" is added, or granted. Innerworldly beings have a connection to Dasein insofar as they have a use, e.g., the pen for writing, the hammer to swing, etc. "The world on you depends,"¹⁵ to quote James Douglas Morrison: Heidegger's notion of world is Dasein-engendered. Dasein assigns relevance to innerworldly beings within the network of relations between itself and the handy or objectively present things, and this network constitutes the "world". It is born of the relevance of innerworldly beings to Dasein.

The "world" is what Dasein is "thrown into". Dasein, as being-in-the-world, happens upon its particular arrangement of possibilities for developing its own existence. "This means both that Dasein exists but is not the ground of its own existence and that Dasein is not itself the source of the basic intuitive and discursive contexture of the world it always already finds itself in."¹⁶ The "world", insofar as it is a network of handy-things and relations to be filled in, exists prior to Dasein's awareness of it. Dasein is only aware of something like "world" after its relations to it have been made and broken, e.g., when the pen does not write, the hammer does not swing. When the handy things are no longer "handy", Dasein finds itself thrown *into the world*. "Thrownness, in which facticity can be seen phenomenally, belongs to Dasein".¹⁷ Dasein experiences the world via the break of relations, becomes aware of its *everydayness* through its *thrownness*. In *thrownness* Dasein sees the world bared of its meaningful connections, it appears to be strange yet always already familiar.

Thrownness, as such, constitutes the crux of our present investigation. It is precisely when we are

"thrown into" the world, as something strange, that a pocket is opened up for us to allow meaning to seep into our existence. When we are faced with an experience for which there is no ready means to explain it, e.g., the first time listening to The Doors, we are given an opportunity to make meaning of our existence, seal it with our signature bearing the mark of authenticity. In these authentic experiences, we break on through to the other side of our everydayness. For Heidegger this prompts the question: *Who are we when we are not being ourselves, i.e. who is it that we are in an everyday way?*

The everyday being of Dasein is prescribed by the *they*.¹⁸ This is Heidegger's account of the basic being-with-one-another, which—although is an existential characteristic of Dasein—is conveyed as a lesser, "inauthentic" mode of being. "Existentially expressed, being-with-one-another has the character of distantiality."¹⁹ Dasein relates to others but at a distance—the *there* of their beings must be in separate places, exposing Being at different places, capacities, and understandings. Here it would benefit our investigation to explore Heidegger's distinction between the *existential* and the *existentiell*. The *existentiell* deals with the *ontic*, with what exists in the world and has "a possibility of being"²⁰, the facticity of an existent entity. The *existential* describes the way in which the *existentiell* is interpreted. Humans are uniquely aware of the *existentiell* component, i.e., facticity, of their existence; we are aware of the fact that we are existing. Since we are aware of it we are also able to interpret the fact that we exist *as well as* the way in which we take up and develop our own existence. Through the *existentiell* we know of the possibility of being—the ability to take up our existence and augment or diminish it at our discretion—by which we take up our *existentials*—the various possibilities at our disposal.

To return to Heidegger's claim ("Existentially expressed, being-with-one-another has the character of distantiality"), when we are among others this being-with can be read as a "being-at-odds-with" wherein each existent recognizes the Crowd of others and makes every attempt to distinguish itself from Them by creating a distance. This distance serves to establish the distinct identity of Dasein in relation to the crowd, the rest, the *They*. In a fashion comparable to the tightrope walker's gait, Dasein seeks to carve out the distance between itself and *They* in order to distinguish itself but not so much that it is rendered completely unlike the others. Attempting to close the gap, "disquieted by the distance", Dasein puts itself in subservience to others through this distantiality. Dasein wants to meet the

¹⁴ Heidegger. op. cit. p. 82

¹⁵ John Densmore, Robby Krieger, Ray Manzarek, Jim Morrison. "Riders on the Storm". Elektra Records. *L. A. Woman*. 1971

¹⁶ Morin. op. cit. p. 25

¹⁷ Heidegger. op. cit. p. 172

¹⁸ Heidegger. op. cit. p. 123

¹⁹ Ibid.

²⁰ Heidegger. op. cit. P. 12

demands of the they and be included in them. They ask Dasein to abandon its being in order to be accepted into the they. It will start off small: “Hey Dasein, come to Outback Steakhouse with us,” but it is a slippery slope, soon Dasein will only eat Outback and refuse to dine at home, where he is closest to *his* being and not *theirs*. In effect, *they* rob Dasein of its being and tailor its everyday being to *their* qualifications.

The *They* function to give Dasein the existential tools to take up its own being. *They* prescribe the basic everyday being of Dasein such that Dasein, before becoming distinct from the others, belongs proximally and for the most part to *they*. “This being-with-one-another dissolves one’s own Dasein completely into the kind of being of “the others” in such a way that the others, as indistinguishable and explicit, disappear more and more.”²¹ Dasein’s being is given to the whims of the herd-mentality. It would seem that Heidegger claims that *they* want each and every Dasein to operate in the everyday way—hammering away their lives, driving the screws home with their screwdriver—making every Dasein like the other. *They* want Dasein to be uniform, homogeneous, *average*. “It is an existential characteristic of the *they*”²². Referring above to the distinction of existential from existentiell, we remember that *existentials* have to do with the capacity to develop one’s existence such that *they* stunt Dasein’s development at the threshold of *averageness*.

Dasein, for the most part, is a being under the sway of the *they*. Heidegger asserts that to properly understand Dasein’s being, one must take a peek behind the curtain of the *they* qua *idle talk*, *curiosity*, and *ambiguity*. Dasein “falls prey” to the *they-self* by engaging in idle, curious, and ambiguous modes of being. The phrasing “falling prey” leads one to believe yet further—almost undoubtedly—that Heidegger regards the *they-self* as a necessarily inauthentic mode of being, not the true being of Dasein; but further investigation awaits before we can readily adopt such language. Our investigation will now focus on explaining precisely how these modes of being merit the language of *in/authenticity*. In the following analysis we will examine *idle talk*, *curiosity*, and *ambiguity* with respect to their capacity to make Dasein inauthentic in its being.

We shall regard *idle talk* as what reduces what is being talked about into the most base, accessible language. One might imagine the speech employed in the breakroom: “How was your weekend, Ned?” “It was great Barb! I watched hour after hour of *Love it or List it*. Now I’ll tell ya, it was so *astounding* to see these people in action!” Really Ned--“astounded”?

In the totality of its structured contexts of signification, expression preserves an understanding of the disclosed world and thus equiprimordially an understanding of the Dasein-with of others and of one’s own being-in.²³

Idle talk assumes a complete understanding of the subject matter, at least at the base level: a disclosure of world as well as the Dasein-with of either party, i.e., an awareness of “the world” and the existences (*Dasein*, i.e., human existences) going about in the world securing their own possibilities of being without interfering in the possibilities of others.. Idle talk assumes meaning where, in all likelihood, it isn’t, i.e., meaning for the individual Dasein, meaning that affirms its existence and helps confront it, is trivialized and made commonplace. The meaning of Being, which is unknown, is talked about with the same confidence as one would talk about a soap opera. It makes what is meaningful the chatter around the water cooler—equates it with the meager two ounces of steak dinner from Outback that Steven won’t shut up about. It dangerously pretends to understand what it does not and builds empty banter on its lack of understanding.

It is crucial to remember that idle talk is only “the *possibility* of understanding everything without any previous appropriation of the matter,” [emphasis added]²⁴. So long as we are on guard against the *they* and *their* mode of being, we will not fall into idle talk with its dangers against Being and its disclosure. We are all familiar with the scenario at the grocery checkout: “How’s your day going?” to which we respond, “Oh, you know...just fine and dandy,” because how are we to respond to such a question at five-thirty in the evening, on our way home from work before having the chance to sit in our favorite lounge chair and ask ourselves just how we are feeling, just how we are processing our interactions with the world and decompressing from them? The threat here posed is in regards to the understanding that is not supported by the authentic *Dasein* and the disclosure of “world”. Such an average and inauthentic disclosure is the next layer to falling prey: *curiosity*.

Curiosity is almost too mild of a descriptor, for *curiosity* is here characterized by an endless and aimless wandering from one thing to the next whereas it usually connotes a genuine inquisitiveness that seeks to uncover even the most minute details of the object of investigation. Heidegger’s curiosity most resembles a child’s—the child will ask about the color of the sky, then will ask the name of the flower that pricked their palm, they will then ask about the liquid that came out of their hand and why it caused such pain, still not satisfied they will ask what “pain” is and then run off to

²¹ Heidegger. op. cit. p. 123

²² Ibid.

²³ Heidegger op. cit. p.162

²⁴ Heidegger. op. cit. p. 163

throw dirt at the cat. The distractedness of the child reminds of the curiosity that makes us fall prey to the *They*. “The two factors constitutive for curiosity, *not-staying* in the surrounding world taken care of and *distraction* by new possibilities, are the basis of the third essential characteristic of this phenomenon, which we call *never dwelling anywhere*.”²⁵ Going about in this fashion—aimlessly and fleetingly—does not allow for any deep meaning to be found in what is being talked about, what is being used, in what is *at hand*. Just the same, “Idle talk also controls the ways in which one may be curious,”²⁶ idle talk has a symbiotic relationship with curiosity.

Curiosity and Idle talk lead Dasein (the being at the spearhead of the interrogation of Being) away from dealing with what is at hand by presenting a myriad of irrelevant tangents.

When, in everyday being with one another, we encounter things that are accessible to everybody and about which everybody can say everything, we can soon no longer decide what is disclosed in genuine understanding and what is not.²⁷

This ambiguity of the *they* extends to Dasein, being-with-one-another, and the world alike. It affects curiosity and idle talk by making everything readily available and average, what is new will seem old and worn, what is fresh and inspiring is now stale and dull. Ambiguity controls the way one may be curious or idle, and one’s idleness determines their curiosity. These modes of being-with-one-another where Dasein loses its Being are almost indistinguishable, just like the *They*.

This is Heidegger’s account of basic being-with-one-another, every form of which robs Dasein of its being. Does this mean to imply that Heidegger’s Dasein doesn’t have a proper and authentic being-with-one-another? Are all Dasein inevitably given to falling prey to the world of others, where “falling prey” to the ‘world’ means “being absorbed in being-with-one-another as it is guided by idle talk, curiosity, and ambiguity,”²⁸? What is an in/authentic being of Dasein?

Inauthenticity does not mean anything like no-longer being-in-the-world, but rather it constitutes precisely a distinctive kind of being-in-the-world which is completely taken in by the world and the Dasein-with of the other in the *they*.²⁹

If these are really only distinctive *possibilities* as Heidegger claims them to be, we might be in the right to ask where in *Being and Time* is the discussion treating the being-with in which Dasein doesn’t fall prey. Referring to the above *Dasein-with*, Heidegger places a great importance on the notion of authenticity,

especially with regards to the individual (the “subject”, *Dasein*), such that the notion of individuality is conflated with a type of self-creation, an independence of identity. Inauthenticity is then, by Heidegger’s mark, rife with falling prey to the circumscriptions of *they*, where Dasein evades its own being choosing instead to disappear into the crowd.

Heidegger gives a positive definition of the authentic being of Dasein amid the discussion of *they*. “The self of everyday Dasein is the *they-self*, which we distinguish from the *authentic self*, that is, the self which has explicitly grasped itself”³⁰. The *they-self* is regarded as the self which evades itself, never seeking to provide its own answers to the question of the meaning of being but rather falling in line (*falling prey*) to the ready-made answers prescribed by *they*. As we have noted above, the *they-self* is characterized by its idle, curious, and ambiguous modes of being that make the meaning of its being commonplace. If restricted to these modes, Dasein would effectively unhinge any possibility of authentic being. The inauthentic modes of being, as inauthentic, do not allow Dasein to tarry with its existence and the questions that it brings to the fore, further driving it into an inexplicit existence where it cannot differentiate itself from those to its surrounding.

Or is it that being-in-the-world cannot be authentic with another being? “As factual being-in-the-world, Dasein, falling prey, has already fallen *away from itself*; it has not fallen prey to some being, but it has fallen prey to the *world* which itself belongs to its being.”³¹ It is not that Dasein can’t be authentic with other beings; it cannot be authentic with itself. So as a matter of fact, Dasein, having fallen prey, falls not under the sway of another entity but of the world, which is *not* a being but a network of relevance by which Dasein assigns significations to the innerworldly beings it encounters in its life.

But if *world* is constitutive of Dasein’s being, would that not, at the least, imply that Dasein *must* fall prey to the world; wouldn’t falling prey be Dasein’s proper being, hence an authentic *there-being*? Does not Dasein relate to itself through the *they*, as that being which is closest—would this make Dasein’s authentic being inauthentic or its inauthentic being authentic? And isn’t the *They* made up of other Dasein who are merely caught up in using handy things, taking care of *their* existence? Heidegger has raked up quite the load of muck. It seems that his Dasein resembles more the subject of metaphysics, the philosophical systems that have tried in the past to give an ontological account based on absolutes or readily accessible notions of

²⁵ Heidegger. op. cit. p. 166

²⁶ Ibid.

²⁷ Heidegger. op. cit. p. 167

²⁸ Heidegger. op. cit. p. 169

²⁹ Ibid.

³⁰ Heidegger. op. cit. p. 125

³¹ Ibid.

world via pure cognition. Dasein is almost tainted and stripped of its being out of the gate.

Heidegger's foundational Dasein has proved to be quite the opposite, providing little to no sturdy base for ontology. Being-with cannot be thought of in terms of an authentic Da-sein; much less can we think of the world as the world full of beings—it is the world as a network of relations. Insofar as humanity is the only being-in-the-world, we are given no way of being-with-others; it almost seems that the very nature of our being-in-the-world gives us no outlet to be-with others and robs us of being from the start.

Heidegger's ontology seems to intentionally ignore the human necessity of community. If the Dasein-with is only exhibited through the they-self, which is by definition inauthentic, what recourse do we have— isolationism? Are we to be hermits living in caves, finding the meaning of our being only through using handy things prolonging our survival? Heidegger seems to have a pretty unenthusiastic image of others, specifically those controlled by an anonymous mob. It is almost as if he weaved a general disdain for humanity into his ontology. In the final count, Heidegger presented an incomplete ontology; it took the *everyday* being of humanity into account insofar as the human stops to question its existence. The one that doesn't question its existence every day in the dealings it has with the world, however, is not given in the ontological account, except by the *They* as an inauthentic mode of existence.

In defense of Heideggerian ontology, however, operating in the world thinking about one's own life and its various dealings-with commands a higher level of intimacy with existence than going along with the project of even one other individual, let alone many others. Coming to grips with one's existence certainly takes a specific kind of being, a kind that isn't endlessly lost in keeping up with the Kardashians. If Heidegger, through his ontology, wanted to expose the authentic being of Dasein, the one that confronts his everyday dealing with the world, then he certainly achieved his goal.

Heidegger still, in a sense, robs anyone of the meaning of his or her existence who isn't suffering an existential crisis. Does this account for all of Being— what about those soccer moms who have to take an Ambien just to sleep next to the husbands they no longer love or the lizard sunning itself on the rock who doesn't question the warmth it is receiving? Do these individuals put the entire meaning of Being in jeopardy?

Nancy: The plurality of being

Jean-Luc Nancy is one of countless thinkers to problematize Heideggerian ontology and its political implications. The center of his critique is the foundational *Dasein* of Heidegger's thought. Heidegger regards Dasein as the only *being-in-the-world*, in one swift move robbing all other existent entities of a place in Being. Dasein's being is littered with mere moments of authenticity which break on through the expanses of an inauthentic and everyday existence. Nancy challenges the language of authenticity and the value-claim inherent to it. If Dasein is the being able to get clear on the meaning of its being, to make sense of the fact that *it exists and can relate to its existence*, it must surely also have relations to other existences that secure its possibility of self-relation at all. It is this relation to other existents, as *communication between existents*, which will come to replace Heidegger's frantic cries for the loss of the meaning of being with the circulation of the meaning of being via the aforementioned *communication*. Nancy teases out the sense to be made of such relations by first establishing the loss of sense which permeates the discourse surrounding Being.

Where Heidegger designates a loss of the sense of self, Nancy appropriates the loss of *sense*.

Not long ago, it was possible to speak of a 'crisis of sense'. But a crisis can always be analyzed or surmounted...Today we are beyond this: all sense has been abandoned. This makes us feel a little faint but we still sense (we have the *sense*) that it is precisely this exposition of the abandonment of sense that makes up our lives.³²

This "crisis" could perhaps be related to Heidegger's pressing need to investigate the meaning of Being once and for all. But this is not enough for Nancy, for a crisis can be mediated and resolved. Nancy claims that whatever "sense" we had is so atomized that it is no longer relevant, it has been outmoded to the point where its lacking is no longer felt as a disorder in need of fixing. This disorder and senseless tumult has become the sense by which we recognize and take up our lives, our being-in-the-world, and claim an identity.

Nancy moves to drive a stake into the ground, a definitive sense, with regard to the "end of philosophy", as the philosophic endeavors have reached their seemingly impossible ends. Nancy claims,

1. that "philosophy" is finished, always finished qua construction of a signification (representation, figuration, Idea, system of the world, system of principles and ends);

2. that it is nonfinishable, yet not according to the bad infinity of a perpetual reposing of questions that

³² Nancy. *The Sense of the World*. University of Minnesota Press. 1997. p. 2

would remain open quite simply because they are badly posed and/or because they pose excessive demands—but, rather, nonfinishable to the degree that the *excessive* or the *badly posed* character of the question is entailed by the demand of signification as such.

According to Nancy, philosophy has achieved the aim it set for itself; the “system of the world” has been given, the orientation has been laid out. As a “construction of a signification”, philosophy has reached its end, its object: it has endeavored throughout centuries to find the meaning of human existence, to make sense of it in whatever way intelligible. This point is further illustrated by the fact that philosophy has brought its own end upon itself by the very nature of the questions it posed and their constant need for reworking, e.g. the investigation presently underway. The aim of philosophy is one that can never be accomplished, and as such, the aim has been achieved qua its inability to be accomplished by necessitating constant reworking.

In an effort to reappropriate the lack of sense afflicting the meaning of Being in the Heideggerian discourse—the disorder and disorientation of Being—Nancy presents the being of *someone*. *Someone* is unto the world, they are what “makes’ up the world and ‘makes sense’”.³³ *Someone* can be a she or a he, even it. The cashier on the other side of the register is *someone* who is part of the world and helps to make sense of it. There is a relation to cashier, as a part of the world; the cashier takes the money, we take the goods, the world keeps turning and spreading its sense. The goods in the bag are *someone*, they make up part of the world—they are the part of the world that satisfies the desire for what we were seeking. The car is *someone* who takes us from the store to our next destination. The existence of *someone* gestures to the plurality of Being configured by its singularity. The sense, or meaning, of Being can then be wrested from a singular existent. It is, in fact, not lost, as some claim.

Even if it were lost, the very denial of it assumes that “One” knows what it is they are in lack of. Going about speaking of the loss of meaning implies that “one” knows the truth of this meaning and, in effect, preserves the integrity of it. “Whether it is aware of it or not, the contemporary discourse on meaning goes much further and in a completely different direction: it brings to light the fact that ‘meaning’, used in this absolute way, has become the bared name of being-with-one-another,”³⁴. If we are circulating the loss of meaning, we must surely be doing so with others. This void of meaning that we are now navigating has become the political platform, the place from which we relate to others is *nowhere*--it is without meaning and, hence, a no-thing, no-where, not here and not “there”. In the expanse, without

anywhere to go, much less without any orientation from which to venture forth, there are those who are as if this complete disorientation is a structure pregnant with meaning.

They say, “Hey! Aren’t you just having the best time, how are your parents, why are you so quiet?” as they push us into the corner near the water cooler, little cardboard cone cups in hand spilling over with tepid water. In a world completely stripped of its meaning, its ability to make sense, lacking its orientation, any gesture towards the void gestures at once to what once filled it, i.e., meaning. In this meaningless water-cooler chat, this *idle talk*, we become acutely aware of the lack of meaning yet we continue to pass it around-- “I’m doing just fine and dandy Catherine, how are you? And how’s that charming cat of yours?”. Our coworker’s name is Jill and she doesn’t have a cat, rather the words eked out just to fill the empty space between you two, the void of meaning. In that empty *idle talk* we feel the lack of meaning, it is palpable (indeed, it is what *is*) and from this lacking we must construct relations to our world and to others. This circulation of the negation of meaning, however, keeps the integrity of it intact and constitutes meaning. We arrive at the conclusion (the “end of philosophy”) that circulation is meaning, and meaning is circulated.

As beings aware of meaning, or its lacking, humanity, qua Dasein, was understandably the privileged being of Heideggerian ontology. Nancy’s critique of Heidegger’s foundational Dasein leads to a more thorough understanding of Heidegger’s failure to reach the ontological aim to uncover the meaning of Being (the infinitive, general “to be”). It may have been that Heidegger bit off more than he could chew by attempting a comprehensive—that is, inclusive—ontology. For Heidegger, humanity is the one being at odds with its existence. To exist has been an apparent hurdle to the thought of western civilization from the Hellenistic period on.

Nancy feels sympathy for the soccer mom, the lizard, and the existentialist equally. But for this sentiment, for the distribution of meaning to the *They* that is the soccer mom, the innerworldly being that is the lizard, and the Dasein that is the existentialist having to “take over its being in one way or another”, there must be a reworking of the “sense of the world”—it must overcome the Heideggerian meaning. Nancy redefines *world* and *Being* to better suit the phenomenon of existence in the world, the infinitive “to be”.

“*World* means at least *being-to*, or *being-toward*... We have known how to categorize *being-for*, or *being-by*, but it still remains for us to think *being-to*, or the *to* of being, its ontologically worldly or

³³ Nancy. *Sense of the World*. p. 70

³⁴ Nancy. *Being Singular Plural*. Stanford University Press. 2000. p. 1

worldwide trait.”³⁵ Nancy wants to move away from the notion that Heidegger, along with many other thinkers, sets forth that the world is the object, setting, or milieu for Dasein. Heidegger portrays the world as having a preliminary static character that always allows for Dasein to build meaning for itself through the network of references. In this way we liken Heidegger to Kant where the world is subject-engendered. The difference being, of course, Kant’s notion of *a priori* forms that shape our perception of the world, and Heidegger’s empirical network of references wedding meaning to our everyday existence in the world, not our perception of it. Nancy is cautious not to place the Dasein outside of the world—that is, as an observing party—nor is it *in* the world but Dasein is *toward* the world, and exists in a similar fashion to the world. Dasein and the world are different manifestations of the same Being. Nancy claims that the world is an existent of “the spatial totality of the sense of existence,”³⁶

The world is a being just as we are beings, just as the dog is a being, and the palm tree, and the stapler. “Being” as “existing”, “existence”, or “an existent”. “The actuality of existence is not a property that can be conferred or not on a thing. It is that there is the thing. The sense of (the) ‘being’ is the transmission of the act that *there is*.”³⁷ Nancy lays the groundwork here for the claim that the meaning of being is everywhere, in every existent. The “sense”, or meaning, of being is given in its existence, i.e. existence acts as, and justifies, the meaning of Being.

Where Heidegger held the meaning of Being as something that had to be interrogated, justified, and individualistic, Nancy claims it to be ubiquitous, without need for defense, and common. With existence acting as Being’s meaning and justification, Nancy claims, “Being consists in nothing other than the existence of all existences.”³⁸ If Being is constituted by the “existence of all existences”, we can read this one of two ways: 1) Being itself is the congregate of all existences or 2) Being is each individual existence. This sets up Nancy’s notion of the plurality of Being, where meaning can be found in any being.

Whether it is aware of it or not, the contemporary discourse on meaning goes much further and in a completely different direction: it brings to light the fact that ‘meaning’, used in this absolute way, has become the bared name of being-with-one-another,³⁹

Meaning is found both in the congregate of existences and in each individual existent. Meaning is, in fact, what two beings communicate to each other whether they communicate the way to the next whiskey

bar or they exchange Facebook information; they nonetheless communicate their existence to one another. Communication of existence has become meaning of existence. Nancy’s ontology is built upon the relations of singularities to one another within the plurality of Being, and this constitutes our *sense of the world*.

The sense we get, i.e. the meaning, found in the world is from the communication of existence, spinning an intricate web of relations. “Sense is the singularity of all the singular ones, in all senses simultaneously.”⁴⁰ Our sense of the world is, instead of a singular sense of one being, is rather a multitude of senses of multiple beings—a multiplicity in the unicity of all Being. The world is inherently a being-with of all beings. This is Nancy’s starting point, for if the world is constituted by a universal being-with, his ontology will give an exposition of its coessentiality with being-in-the-world.

Nancy claims, “The analytic of *Mitsein*...remains nothing more than a sketch; that is, even though *Mitsein* is coessential with Dasein, it remains in a submissive position.”⁴¹ The significance of being-with-one-another is downplayed, and even treated as a lesser form of being, by Heidegger. We are given no further investigation of being-with-one-another than the inauthentic being that is the *They-self*. This cannot operate as a principle of Being if it is inauthentic, and even less can it be the constitution of Being, as Heidegger claims it to be.

Heidegger displaces authentic being from any *being-with*, one fades into the crowd. “In principle, ‘being-with escapes completion and always evades occupying the place of a principle’⁴². Being-with cannot be the principle of the world without also acting as it is one of its origins. Being-with must be taken as the starting point, there is no being that is not also *with* some other existent, even if only the *being* of the world. Meaning is not found in the *being* of being-with but in the “—with”. “The meaning of Being’: not only as the ‘meaning of with,’ but also, and above all, as the ‘with of meaning,’⁴³. For there to be meaning, there must be a self, and a self necessitates a *with* that structures the self.

“Self is primarily nothing other than the ‘as such’ of Being in general,”⁴⁴. Self is how Being experiences itself; it is the being of Being. The “self” is prior to “me” or “you” and expresses the plurality of the origin of Being. Every being has a “self”; we say, “Let me introduce my self,” and “Wow, it’s such a tragedy that Cobain killed himself,” we even say of the bumblebee “it stung itself and died”. All these selves assert the plurality of Being, which in turn asserts a necessary

³⁵ Nancy. *Sense of the World*. p. 8

³⁶ Nancy. *Sense of the World*. p. 56

³⁷ Nancy. *Sense of the World*. p. 27

³⁸ Nancy. *Being Singular Plural*. p. 39

³⁹ Nancy. *Being Singular Plural*. p. 1

⁴⁰ Nancy. *Sense of the World*. p. 68

⁴¹ Nancy. *Being Singular Plural*. p. 93

⁴² *Ibid*.

⁴³ Nancy. *Being Singular Plural*. p. 37

⁴⁴ Nancy. *Being Singular Plural*. p. 94

being-with, the “with” from which the meaning of Being derives. Nancy asserts the coessentiality of being-in-the-world with being-with-one-another and debunks the primacy of being-in-the-world, Dasein, to highlight the fact that Being belongs to all existents and its meaning lies in their communication with one another.

The singularity of each being does not separate it from the rest of Being, it is rather that its separation is like a sharing in the totality of Being. Nancy remarks, “singular unicity is what shares it out and what it shares with the totality,”⁴⁵ in fact it is what further emphasizes its place in the totality of Being. Nonetheless, every being is so disparate from the next, so strange. “You are so absolutely strange because the world begins its turn with you,”⁴⁶. Each person, each being has a different origin of the world, a touch of meaning that is other, and this shifts the world one way or turned around to the left. This is what we mean when we say “People are strange, when you’re a stranger”⁴⁷. We are not yet acclimated to the being of others, and so they are “strange”.

So when we see “people”, the masses, prior to differentiating them from even amongst themselves, are seen as one unrecognizable mob. They are, indeed, strangers. “People” are silhouettes that are both imprecise and singularized, faint outlines of voices, patterns of comportment, sketches of affect, not the anonymous chatter of the ‘public domain,’⁴⁸. Nancy, like Heidegger, notes the indistinct character of those who make up the group of people whom we distinguish ourselves from. And it is strange that we would do so. People do not follow an archetype: they express certain, individual behavioral patterns; they represent, roughly, sketches and outlines of what “real people are like”, each one as distinct from his neighbor as we are. Without this differentiation, however, of ourselves from *them*, there would not exist *someone*.

Someone is the response to the question “Who is there?” To this there is always an answer; there is always *someone* there. “But there is someone, there are numerous someones, indeed there is nothing else. *They* are unto the world. This is what ‘makes’ up the world and ‘makes sense’.”⁴⁹ *Someone* is an existence in the world: I am someone, you are someone, my doggy is someone, and the door is someone. The being of multiple someones gestures to “an origin; it is an affirmation of the world, and we know the world, and we know that the world has no other origin than this singular multiplicity of origins”⁵⁰. Being is each time different from itself in every different manifestation, while still retaining the integrity of Being. This is the

originary character of all beings. *Someone* has an origin that is regarded as “the other origin of the same world”.⁵¹

“*Someone* is, first of all, less a being-present than an engaged presence—engaged perhaps first in nothing other than the being-*here*, exposed *there*,”⁵². We engage beings immediately, in the “here” of our world through the “there” that we occupy in our there-being. I engage *someone* turning the doorknob, cradling my doggy, or talking to a close friend. I expose their being in my own Dasein. *Someone* is what shapes my world, which is inherently a being-with, where the “with” is the meaning of Being.

Someone, insofar as they allow me to be-with them, is what allows me to uncover the meaning of Being. The otherness of the *They* immerses me in *their* being, robs me of the handle I have on my life, but *Someone* lets me into my own being within the whole of Being. *Someone* does serve as a direct analogue to the *They*: its uniqueness contrasted with *their* distanciality, *someone’s* being whatever is similar to the *their* averageness, and *someone’s* exposed character can be seen as *their* publicness.

The *they* are seen, at first, when *they* are still distinguishable from our own Dasein. *They* are at a distance from us, distinct and unique from our being. We see *them* as one entity, one identity, as *someone*. We see *them* as a distinct being outside of us, as a singular being. “The unicity of the singular consists quite exactly in its multiplicity”⁵³. *They* are *someone*, *someones*, and a plural *someone*. Out of many beings, *they* coalesce into a singular *someone*. *They* are outside of our being, differentiated from us, *unique* and *distanced*.

Within the unicity there is no commonality other than the individuality of the existences. *Someone* is hardly at a distance from *someone* else. That is to say, every *one* who is *someone* is indistinguishable. “No doubt, the singular is *per se*: it singularizes itself only by or through its singularity. But this does not mean that its singularity is its own: singular unicity is what shares it out and what it shares with the totality of singular multiplicity”⁵⁴. This *singularization* can be observed in today’s society where everyone has a justified claim to *their* individuality. *They* say they are different from the rest of the mob because *they* smoke Lucky’s and not Marlboro’s; *they* shop at Costco while the rest shop at Kmart (those silly Kmartyrs...). Every *one* is different from the rest in the exact same way—everyone in effect applies the same signature to the corners of *their* paintings.

⁴⁵ Nancy. *Sense of the World*. p. 72

⁴⁶ Nancy. *Being Singular Plural*. p. 6

⁴⁷ Jim Morrison and Bobby Krieger. “People are Strange”. *Strange Days*. Elektra Records. 1967

⁴⁸ Nancy. *Being Singular Plural*. p. 7

⁴⁹ Nancy. *Sense of the World*. p. 70

⁵⁰ Nancy. *Being Singular Plural*. p. 9

⁵¹ Nancy. *Being Singular Plural*. p. 11

⁵² Nancy. *Sense of the World*. p. 70

⁵³ Nancy. *Sense of the World*. p. 71

⁵⁴ Nancy. *Sense of the World*. p. 72

This uniformity of *their* dissimilarity makes them *unique* from one another but only slightly, and still completely other from our being. *They* exist both as singularities and as *some one* body, as a collective. “The relation is contemporaneous with the singularities. ‘One’ means: some ones *and* some other ones, or some ones *with* other ones”⁵⁵. Hair-splitting differences like “Individual A” and “Individual B”; C; D, and so forth can identify them amongst each other, but all these “individuals” fall to the sway of the alphabet all the way to Z. The ambiguity of *someone’s* unique character lends itself nicely to the ambiguous distantiality of the *they*.

Insofar as it is ambiguous, *someone* is also *whatever*. *Someone* is always already reduced to the commonality of the others.

It amounts to considering that what is common to one and all, their communication with each other, is what singularizes them and consequently what shares them out and divides them up. What is commensurable in them is their incommensurability⁵⁶.

This further expounds the unique character of *someone*. Each one is different from the others, but in such a standardized way, that *they* are easily commensurable. What makes *them* similar is the shared incommensurability from others. *They* are reduced to the most base being, the fact that they all belong to Being is *their* unifying thread.

“The tendency of being-with which we called distantiality is based on the fact that being-with-one-another as such creates *averageness*. It is an existential characteristic of the *they*”⁵⁷. There needs to be commensurability between beings—even at the most base level—to gain an apprehension of the plurality of Being. The distance from one being to the next seems to necessitate the bridge of *whatever* or *averageness* if any conception of Being is to be had. We observe the leveling down of Being in both Nancy’s and Heidegger’s ontologies.

The above tendencies of a being to level itself down are undergone in an effort to expose Being. “Each one is presence itself—final, achieved, eschatological”⁵⁸. Every being begins the exposure anew and ceases when it dies—this is what is meant by “you’re absolutely strange because the world begins its turn with you”⁵⁹. Each is an incarnation, so to speak, of Being. It *is* Being realizing itself. We are plagued with the existential analytic because we are at once Being the universal but also its negation: we are the particular being. In this way, however, “there is nothing to be expected from a

someone other than—exemplarily—its being-someone”⁶⁰. A being has no essence, commandment, or other such infringement of its being other than the necessity of its existence. If a being *is*, then it is *someone*.

What *someone* presents in its Being is “coming-into-presence, and thus, the *différance* of its being-present”⁶¹. *Someone* affirms its being via the negation of other beings’ Being. Nancy borrows the term “*différance*” from Jacques Derrida’s 1963 paper “Cogito et histoire de la folie” where Derrida defines “*différance*” as the myriad of gestures given in textual meanings. It is both the deferral of existence, where a word will never summon the object of what is communicated and beseech additional words to contextualize the first; and as the difference between the elements that underpin signification itself.⁶² *Someone* sets its Being apart by naming it *their* own and must constantly put a semblance of specificity to it through meanings and significations that are each discordant with the next.

“What is exposed in this way is thus a singular transitivity of being, and what every one engages in is an attestation of existence”⁶³. Being passes through the multiple singularities, this is its transitivity, each affirming *their* difference from the rest, attesting to *their* existence. It affirms that sense, in its multiplicity, be felt each time singularly. It wishes to *expose* its existence as sufficient in the singular—“something like: ‘I am well grounded in my existence’”⁶⁴.

This is the publicness that Heidegger spoke of. “Publicness initially controls every way in which the world and Dasein are interpreted, and it is always right”⁶⁵. Insofar as *exposure* sets apart the singularity of a being-in-the-world, it makes it public. Its Being is given to the world for interpretation, the world of others that is. Dasein’s closest Being is the *they*, the surrounding world of others—each asserting *their* own existence—from which Dasein builds a world of meaningful relations to entities. Dasein has no self but the *they-self*, no being but the being-*with*.

In fact, we could read Nancy’s *someone* as the Heideggerian *they* almost directly: “there is someone, there are numerous someones, indeed, there is nothing else. *They* are unto the world. This is what ‘makes’ up the world and ‘makes sense’”⁶⁶. It is not that the world is *someone* per se rather that the plentitude of beings that constitute *someone* exists in the world and shapes our apprehension of it. In the same way, the *they-self*, which is Dasein’s everyday self, “prescribes the kind of being

⁵⁵ Nancy. *Sense of the World*. p. 71

⁵⁶ Nancy. *Sense of the World*. p. 72

⁵⁷ Heidegger. op. cit. p. 123

⁵⁸ Nancy. *Sense of the World*. p. 74

⁵⁹ Nancy. *Sense of the World*. p. 6

⁶⁰ Nancy. *Sense of the World*. p. 74

⁶¹ *Ibid.*

⁶² Farlex Dictionary. Definition of “*différance*”

⁶³ Nancy. *Sense of the World*. p. 74

⁶⁴ *Ibid.*

⁶⁵ Heidegger op. cit. p. 123

⁶⁶ Nancy. *Sense of the World*. p. 70

of everydayness”⁶⁷. *They as someone* and as some *ones* prescribe the modes of our everyday dealings with the world.

Nancy’s ontology explodes the rigidity of the Heideggerian discourse prescribed by the notion of authenticity. Augmenting the scope of Being, Nancy decidedly does not being with any one being (e.g., *Dasein*) but instead speaks about the plurality of Being, found everywhere there *is* something (*someone*) which exists. The existence of *someone*, e.g., a coffee thermos, communicates its existence to *someone* else, e.g., the table on which it rests or the frantic typist that is the student finishing their final paper of the semester. The defining characteristic of existence is not the ability to develop and take itself up but rather the mere fact that an existent *is* in the world among other existent entities that all contribute to the flux of being we are all participating in.

Applying Nancy to Heidegger

Nancy frames his ontology slightly differently than Heidegger’s. By emphasizing the plurality of Being, and its inherent singularity, Nancy announces the ambiguity of Being as existence. The multiple origins of the world, each beginning with every existent respectively, affirms each meaning of Being along with each existence. There is no “wrong”, or *inauthentic*, being in Nancy’s account. Every being is authentic insofar as it *is*.

Heidegger, by contrast, began with *Dasein* as the sole witness of “world”. The clear definitions of *Dasein* and the *they* do not leave much room for an ambiguous sense of Being, one that is malleable and fitting of every existent. Heidegger in a sense gave only *Dasein*’s ontology: the meaning of Being must be interrogated otherwise it is absorbed in the *they*, if the existent can’t interrogate its being, it is a thing absorbed in its worldhood. It seems quite clear that Heidegger wanted to expose all of Being but could only get as far as the *Dasein*, which is itself quite sprawling, for it is the being who takes care to expose its being. The *They* and innerworldly beings have their being always already exposed, always public.

Both authors respond to the apparent human need for distinction of being. No one wants to be ordinary. In fact, this may be the crux of the “existential crisis” as a struggle for exclusive individuality: “what we receive most communally as ‘strange’ is that the ordinary itself is originary”⁶⁸. Humanity is under the assumption that the only way to live a truly “authentic life” is to grapple with one’s own existence and separate oneself from the pack. In this regard, Heidegger deals with the human *being* and its role within all of Being to find the

“meaning” of it. Nancy makes no such effort, for it would all be in vain.

Heidegger makes it a point to separate *Dasein* from the *they*, effectively raising a barrier in Being, placing *Dasein* as the foundation for, at least, human *being*, and the interrogation of Being in general. *Dasein* has only two modes of being, *authentic* and *inauthentic*. Nancy shows how this leads to a skewed ontology: it is bound to be anthropocentric. It does not account for the lizard or the door that have no notion of *authenticity*. Instead, Being *as* being is justified in itself according to Nancy. Moreover, the notion of *someone* underscores the plurality of Being, making it inclusive to beings other than *Dasein*. Being has a myriad of registers, each one of which is “strange”, none of which rob *Dasein* of its being. From this we can conclude “the streets are uneven when you’re down”⁶⁹.

If we allow ourselves to be bogged down by using handy things and ignore the immediacy of our existence, we will *fall prey* to the *they* insofar as we abandon the authenticity of the project of *our own* existence, our own *Dasein*, to the project of the masses. We are only at the mercy of this as long as we feel that there is integrity to protect, as long as we are incapable of a being-*with*. If there is no separation of Being from some one to another, if all exhibit Being as being, there is a being-*with*. The mob of the *they* will not hang over us and the streets will be even, facilitating a circulation (preservation) of the meaning of Being.

Concluding remarks

You’re still sitting in the middle of the long table in a dreary room with your coworkers and their nifty ties and skirt patterns. Everyone is perfectly themselves, even Ida with the same wacky and expressive skirt she wears every Wednesday: but there stands Steven with your thermos and there you sit with his. You’re frozen in despair at what he will say, what They will say, about the chalice of your choosing. In your panic you start to think of all the excuses you could offer that would justify having the exact same one as Steven-- “It was a gift from my aunt,” ; “it was on sale and I didn’t want to pass up a bargain,” ; “I can always replace it, I don’t really like it anyway,”. Like a somnambulist making their way through a nightmare, you hurry to look for a way out where there is none. Suddenly, waking from your despairing state, Steven sits a comfortable distance across from you and says, “Hey nice thermos”.

Recalling the Heideggerian sentiments, we mourn the loss of individuality, novelty, and feigned “authenticity”. Counter to its original aim, the thermos did not help distinguish you in relation to your

⁶⁷ Heidegger. op. cit. p. 123

⁶⁸ Nancy. *Being Singular Plural*. p. 10

⁶⁹ Jim Morrison and Bobby Krieger. “People are Strange”. *Strange Days*. Elektra Records. 1967

coworkers and render you authentic. So much for that... But it did inaugurate the sense of community between you and Steven, opening up lanes of communication between the two of you born of the common canister. The distance was bridged and suddenly Steven was not so strange. Every morning since he gives you a welcoming nod as you enter the office, it is easier to sit and have lunch in the break room if he is in there. You punch in, chat with Steven griping about everything from Sundays to smoke breaks, help a few dozen angry customers, go to the water cooler with Ida and compliment her dress, upload some data to the cloud for corporate, and you punch out. The office rings less like an unhinging din and more like a symphony utterly without direction--not unpleasant but quite busy all the while accomplishing no work.

To make sense of such a symphony one must pay attention to the movements and billowing swells of sound, one must be the maestro of their own masterpiece. We learned this from Heidegger: *Dasein* is the being who takes a step back from the immediate givenness of the reality before it and how it is relating to its givenness. In stepping back we see before us the connections all around and we become aware of the phenomenon of the world, the one in which we walk, talk, make friends, and bury our pets, and we are aware of the way in which we interact with our world as a measure of our individual existence. But these are mere moments in the span of a lifetime--sometimes few and far between! We pour coffee, wear clothes, drive cars, do jobs, eat foods, sleep and abuse the snooze function on the alarm--every day we do this, and precisely in our everyday way.

This is well and good but surely we don't all live our everyday lives every day. In fact, there are days when we wear our favorite pair of socks, we bring the thermos from *Skymall* magazine to the office. *Dasein* carves its own relation to its being, has its own answers to Life's perennial questions, watches and is aware of the world in order to do the everyday dance to its own beat. This is its crowning *authenticity*. But then one might ask where it was learned to wear such expressive socks or to drink a cup of coffee to get the day going, where did we learn to make and dance to our own beat? We learn to dance, follow the fashion trends, use language, wear sunglasses all from others--these expressions of our individuality are not as authentic as we thought them to be! Yet within that caveat we advance the claim, "They are authentic to me, I myself: I separate myself from the Crowd, strutting in style, I smoke Lucky's not Marlboro's, when I am running low on energy I depend on Duracell batteries whereas my peers use Energizer, and this makes me who I am today". We each make selections and concessions in the courses of our lives, individually shaping our existences this way or that. As we look around we are at a loss already,

for we are not as individual (not as authentic) as we think.

Ringling in our ears now are words of Nancy exploding the language of authenticity. We really must abandon this terminology, its bankrupt on selling. We truly have no claim to proper authenticity because we do, in fact, learn to confront our existence with work, play, custom autos, and broad brushstrokes from the others around us also taking up and taking over their beings. We communicate our existence to others and others to us. We face existential despair equally alone and alongside others. From Heidegger on high comes the caution to not lose oneself in the responses to such despair of the selfless they-self: glazing over the lack of grounding in our lives by responding to such questions as "Hey! How are you?" with the all-too bright "Just fine and dandy" before truly asking ourselves how we are doing--bothered, elated, distressed, complacent, tired, or perhaps we are truly doing well. This self-relation is very much lacking and it manifests in the interaction with others.

When we interact with the world it is always an interaction with what is other, what is strange and utterly unknown. Show me one map, a guidebook for all of existence with its tremendous triumphs, debilitating devastations, and everything between. It is true, only we are to live our own respectively unique lives and die the corresponding deaths. We are allotted that much authenticity. But in terms of taking up our own existence the claim to authenticity leaves us unconvinced given the ubiquitousness of existence in all its registers from welcome mat to mailman. By relating to each register, turning none away due to inauthenticity, we gain a yet greater appreciation for the relation we have to our own existence. The act of being is had in the relation back to self, always and without question.

We relate to our existence through the medium of the world in (or alongside) which we find ourselves. The world consists of ourselves, the phones in our pockets, the cars we drive, the jobs we take on to keep the dimes and quarters jingling in the pocket, the people and critters in our homes, and ultimately the relations which bind them all together in the network of our existences. While the world and its entities are not regarded as of a lower order than our own, we are nonetheless closest to ourselves--and precisely for that reason strangers to ourselves! We take our self-relation as given, seeing no need for further investigation of what is so plain to see in an everyday way.

It is when we endure experiences that transgress the everyday norms, e.g., seeing a new dog walking through our neighborhood, when your card is rejected, when we meet a new face, that we suddenly are acutely aware of ourselves in a phenomenal way. *This* is the self-relation Heidegger speaks of, where we take an account of ourselves and register who it is that we are in relation to

this whole matter of existence happening as it were before us. We must pay heed to the distance between ourselves and our own existence, being careful not to overextend into dealings that are not our own (not *authentic*). Though to know what is properly ours does require some exploration and education. What needs our attention is the distance to other existences that we must bridge.

Indeed “people *are* strange” because they take their existences this way and that. It is no easy task to apprehend what is utterly distinct. For this we must take into account where we are in relation to others, mind the gap, and communicate to them how it is that we are taking up our existence and separating ourselves from the Crowd as well as receive their transmission. But in the cases where the distance is too great, putting any communication in jeopardy, we must also have the wherewithal to acknowledge and respect our own limits. Surely one can admit that the interaction with an infant is distinct from that with a fully grown individual, and that these relations are also distinct from those to the dogs in the yard, from the dogs to the bees flying through the trees, so on and so forth. We relate to every existent according to its capacity to receive our transmission and to send one back in kind.

Such a relation, born from the happy marriage of the claim to *authenticity* and the plurality of Being, is one of constant flux. We need to acknowledge the fact

that the streets are uneven, we must shift gears and communicate with a greater range of existences, some at our capacity like the friend and others at their own levels like the pups tearing through the yard terrorizing the bees and butterflies. We must communicate with and participate in the plurality of Being, ever reminding ourselves of our distinct space within it along with our disparate relations to others. In our relations to and dealings with the world we will at times happen upon ourselves as a stranger in a strange world, only to discover this as a yet unknown possibility of our existence. At such a juncture we must familiarize ourselves with this, our possibility of being, and remember that “people are strange when you’re a stranger” and “the streets are uneven when you’re down”⁷⁰

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Stabilizing Kant's First and Second Critiques: Causality and Freedom

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Abstract

In the *Critique of Pure Reason* and the *Critique of Practical Reason*, Kant examines the problem of causality and freedom in relation to epistemology and ethics. What is puzzling about the two Critiques is how each Critique produces a different outcome regarding the status of causality and freedom. This results in clear differences between the extent of causality and freedom in the world, especially in regard to the possibility for there even being freedom at all. The problem of discontinuity arises between the first Critique and the second Critique as the second Critique must reconcile freedom and choice with the first Critique's mechanical causality. In order to resolve this problem, this paper will refer to and focus on the proposal by Bencivenga who argues that Kant's conception of causality changes from a causality of imposition in the first Critique to a causality of regularity in the second Critique. Understanding this change will resolve the discontinuity between the two Critiques and produce two separate arguments that are coherent.

Keywords: Kant, Bencivenga, philosophy

Introduction

In the first Critique, Kant strongly establishes causality and determinism by arguing that causality is an a priori concept of the understanding, while freedom remains uncertain as the antinomies show freedom to be neither provable nor disprovable. On the other hand in the second Critique, it is through Kant's conception of the duality of the will, where the will consists of a legislative role and an executive role, that Kant is able to clearly affirm the reality of freedom while also maintaining causality and determinism. A disjointedness between the two Critiques appears to have occurred as the second Critique establishes what the first Critique found to be impossible, freedom in reference to causality. In order to solve the separation

between the two Critiques, Bencivenga argues that the first Critique is operating on the terms of a causality as imposition, while in the second Critique causality must be understood as regularity.

In response to this problem, various solutions have been presented, such as the one by Bastera, who argues that this discontinuity can be resolved in reference to the usage of different spheres of reason, theoretical reason and practical reason.¹ Guyer presents another solution by arguing that "determinism is either irrelevant to or actually necessary for the most important forms of moral judgement."² Alternatively, Pinkard points out that there is a difference between free-choice and free-will, in which the latter, free-will, cannot truly be established.³ However, this paper will attempt to show

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¹ Gabriela Bastera, *The Subject of Freedom Kant, Levinas* (New York: Fordham University Press, 2015), 15. Bastera analyzes various problems within and between Kant's first Critique and second Critique, including the relationship of causality/determinism and freedom. In regards to any discontinuities, Bastera argues, "that the two different approaches...do not necessarily signify a shift in Kant's conception. Rather they should be interpreted in light of the limits of theoretical reason as Kant conceived of it"(15). Bastera is arguing that the argument of causality/determinism and freedom in the first Critique must be understood and interpreted differently than the argument in the second Critique because Kant is contextualizing each argument in reference to a different field of reason, theoretical reason versus practical reason. Bastera understands that when the arguments of causality and freedom are understood this way, both arguments in the first and second Critiques are equally valid. Bastera's argument is structured in reference to Kant's third Critique, where Kant emphasizes the different spheres of reason.

² Paul Guyer, *Virtues of Freedom: Selected Essays on Kant* (Oxford: Oxford University Press, 2016), 146. Guyer argues that determinism is irrelevant because "even if our future choices are in principle fully determined by our prior histories and the laws of nature, we can in practice never know either of those in adequate detail to know what they actually entail, and so can instead only try to determine what would be right or best to do and to act accordingly, just as we would if our actions were not actually determined by our past." In other words, determinism is irrelevant because it is impossible to truly know those causal laws, which results in one still being in the position of having to act as if one's actions were not determined. Guyer also argues that determinism is necessary in moral judgment because reward and punishment presupposes the belief in determinism, or that they "do act as causes that will contribute to the determination of future actions"(146).

³ Terry Pinkard, *German Philosophy 1760-1860: The Legacy of Idealism* (Cambridge: Cambridge University Press, 2002), 55. Pinkard argues that, "Our actions in the social order could only be regarded from the moral point of view as an expression of free choice, not free will; since there is no way that a public order could ever peer into men's souls to discover whether they were acting out of a sense of duty or a sense of personal advantage, the highest level of ethical life to which the public order could aspire would only be that of a harmonization of free choices under public law, not that of a

that Bencivenga's proposal was correct in interpreting the causality in the first Critique as mechanical and the causality in the second Critique as regularity, and that this interpretation is necessary for the coherency of the two Critiques.

Bencivenga begins by differentiating between a causality of imposition and a causality of regularity. Bencivenga understands causality of imposition to be "an event literally forcing another to come to pass" while a causality of regularity is "events of certain kinds following one another in predictable ways, according to patterns that can be recognized."⁴ What differentiates a causality of regularity from a causality of imposition is that a causality of imposition is a kind of kicking in the door that produces an event with unique universality and strict necessity, while a causality of regularity does not. In other words, a causality of imposition entails the process of Cause A universally and necessarily producing Effect B in which Effect B always follows Cause A with strict necessity. If Effect B was discovered to not have been produced by Cause A but a Cause C, then under the terms of mechanical causality there would only be a causal relationship between Cause C and Effect B, and Cause A would be dismissed. A causality of regularity differs from the causality of imposition because it does not make the claim of strict exclusivity. A causality of regularity allows for the possibility to account for Effect B by a multiplicity of independent causes. In other words, a causality of regularity would allow for Effect B to be fully accounted for by Cause A, as there are patterns of regularity in which Effect B follows from Cause A, but also that Effect B could be fully accounted for by Cause C if there too are patterns of regularity. What is effectively produced by the concept of causality of regularity, is that different explanations may be given in relation to the context of different aspects in a singular situation.

Critique of Pure Reason and causality as imposition

In order to establish causality as imposition, Kant begins by providing a justification for a priori concepts. Kant argues that a priori concepts are necessary in order for experience to have any coherence and unity at all. Kant writes,

Accordingly, concepts of objects as such presumably underlie all experiential cognition as its a priori conditions. Hence presumably the objective validity of the categories, as a priori concepts, rests on

community of virtuous individuals"(55). In other words, the practical necessity of presupposing free choice through public law could be integrated into the public order, but the confirming of a free-will is impossible.

⁴ Ermanno Bencivenga, *My Kantian Ways* (Berkeley: University of California Press, 1995), 34.

the fact that through them alone is experience possible (as far as the form of thought in it is concerned). For in that case the categories refer to objects of experience necessarily and a priori, because only by means of them can any experiential object whatsoever be thought at all...Without that original reference of these concepts to possible experience wherein all objects of cognition occur, their reference to any object whatever would be quite incomprehensible.⁵

Kant is arguing that the a priori concepts, or categories, are the foundation that allows for the form of thought in experience to be possible. It is because one can note the consistency and coherence of thought in relation to objects of experience that a priori concepts must be assumed. When the a priori concepts of understanding are combined with intuition's a priori forms space and time, only then can comprehensible cognition take place. Therefore, Kant finds that the establishing of a priori concepts of the understanding is necessary and justified.

Kant then applies the general argument for a priori concepts to the concept of causality by arguing that an a priori concept of cause and effect is also required for consistency in experience. Kant elaborates upon cause and effect as an a priori concept of the understanding by writing,

The concept of a cause would get lost entirely if we derived it as Hume did: viz., from a repeated association of what happens with what precedes, and from our resulting habit of connecting presentations (hence from a merely subjective necessity). But we do not need such examples in order to prove that pure a priori principles actually exist in our cognition. We could, alternatively, establish that these principles are indispensable for the possibility of experience as such, and hence establish their existence a priori. For where might even experience get its certainty if all the rules by which it proceeds were always in turn empirical and hence contingent...⁶

In other words, the concept of cause and effect must be an a priori concept or else causality will be derived from empirical observations and fall susceptible to Hume's skepticism. Kant argues that in order to have uniformity, consistency, and rules of causality within experience, causality's foundation cannot be based on the "habit of connecting presentations." Rather causality must be the a priori concept that allows for the very possibility of "connecting presentations." Friedman notes that in labeling causality as an a priori concept in the Table of Categories, "Kant appears to be explicitly

⁵ Immanuel Kant, *Critique of Pure Reason*, trans. Werner S. Pluhar (Indiana: Hackett Publishing Company, 1996), A 94.

⁶ Immanuel Kant, *Critique of Pure Reason*, trans. Werner S. Pluhar (Indiana: Hackett Publishing Company, 1996), B 6.

endorsing just the kind of necessary connection, efficacy, or nexus between cause and effect that Hume notoriously rejected.”⁷ Kant understands causality to be an a priori concept because he believes that the ability to secure rules and laws in nature is necessary for certainty in nature, a certainty he finds to be vital. One important historical note in understanding Kant’s relationship with causality and determinism is that Kant was heavily influenced by the work of Isaac Newton, including Newton’s laws of motion. Wartenberg notes this influence by writing, “Kant’s philosophy is often characterized as an attempt to provide the metaphysical foundation for Newtonian science...the result of his commitment to show the legitimacy of Newtonian science...”⁸ Recognizing that Newton laid the foundation for classical mechanics/physics where the concept of causality was evident, provides further contextualization for why Kant holds causality to be an a priori concept of the understanding. Furthermore, Newton’s conception of causality is mechanical or of imposition, which provides an indication into the nature of Kant’s conception of causality.⁹

After having posited causality as an a priori concept, Kant articulates his conception of causality as being mechanical or of imposition. Kant writes,

Let me take, e.g., the concept of cause. This concept signifies a special kind of synthesis where upon the occurrence of something, A, something quite different, B, is posited according to a rule...For this concept definitely requires that something, A, be of such a kind that something else, B, follows from it necessarily and according to an absolutely universal rule. Although appearances do provide us with cases from which we can obtain a rule whereby something usually happens, they can never provide us with a rule whereby the result is necessary. This is, a dignity that cannot at all be expressed empirically: viz., that the effect is not merely added to the cause, but is posited through the cause and results from it.¹⁰

What follows from the concept of causality being a priori, is that the concept of causality entails complete necessity, strict determinism, and absolute universality between Cause A and Effect B. If the concept of causality were produced through empirical observation,

the production of Effect B from Cause A would only be a process that only “usually happens,” lacking definite certainty. However because causality is an a priori concept, Kant argues that there is an “absolutely universal rule” that generates and enforces a strict necessity for the production of Effect B from Cause A. Effect B will be universally and necessarily produced from Cause A where Effect B is always a result of Cause A. Friedman notes that not only is one able to “assert, with true or absolute universality, that *all* events of type A are followed by events of type B,” but that “all events of type A are *necessarily* followed by events of type B...understood in terms of strict universal causal laws.”¹¹ This universality and strict necessity that is contained in the a priori concept of causality is then expressed in causal relationships experienced in the world. From this Bencivenga comments on Kant’s causality as follows:

What makes the world one world (and makes experience one experience) is the connectedness of events, the fact that all of them can in principle be accounted for as necessary consequences of their antecedents, thereby justifying that precisely *that* event had to be part of this world, that one should not have expected any other, that not only is the event no disruption of the identity of the world, but in fact it is an integral part of that identity.¹²

In other words, the causal relationship that Kant establishes is a process akin to a kicking down of the door—it is mechanical and of explicit imposition. This mechanical causality not only completely structures experience and the “connectedness of events,” but the world as a whole integrates and expresses this causality of imposition.

Causality as Imposition, Freedom, and the Antinomies

Kant eventually turns toward the question of freedom’s possibility in light of the causality of imposition necessary for experience’s coherence. He analyzes the possibility of freedom in the first and third antinomies by presenting two different arguments regarding freedom. However, Kant structures each

⁷ Michael Friedman, “Causal laws and the foundations of natural science,” in *The Cambridge Companion to Kant*, ed. Paul Guyer (New York: Cambridge University Press, 1992), 162.

⁸ Thomas E. Wartenberg, “Reason and the practice of science,” in *The Cambridge Companion to Kant*, ed. Paul Guyer (New York: Cambridge University Press, 1992), 228.

⁹ Patrick Suppes, *A Probabilistic Theory of Causality* (Amsterdam: North Holland Publishing Company, 1970), 6. Suppes notes that there is a connection between Newtonian mechanics and the influence that it had on other philosophers during that time period, including Kant. Suppes writes, “The apparent universality and certainty of this mechanics led Kant and other philosophers into a mistaken notion of causality. The overwhelming empirical success of

Newtonian mechanics...yoked the notions of causality and determinism...it was impossible to talk about causes without thinking of them as deterministic in character.” According to Suppes, understanding Kant’s notion of causality as mechanical would be historically correct.

¹⁰ Immanuel Kant, *Critique of Pure Reason*, trans. Werner S. Pluhar (Indiana: Hackett Publishing Company, 1996), A 90- A92.

¹¹ Michael Friedman, “Causal laws and the foundations of natural science,” in *The Cambridge Companion to Kant*, ed. Paul Guyer (New York: Cambridge University Press, 1992), 164.

¹² Ermanno Bencivenga, *My Kantian Ways* (Berkeley: University of California Press, 1995), 33-34.

argument by presenting the thesis and antithesis of each argument, resulting in a justification for both the thesis and antithesis. By showing that both the thesis and antithesis of each argument is equally plausible, Kant shows that freedom is neither provable nor disprovable, leading to uncertainty for freedom. The first antinomy deals with freedom indirectly as the thesis argues for a world with a beginning in time and enclosed in space, while the antithesis argues for a world that is infinite in both time and space, with no beginning and no boundary. The connection between the first antinomy and freedom is made clear in the third antinomy as the thesis in the third antinomy directly argues for a world with laws of freedom, while the antithesis argues for a world with only causal laws. The third antinomy shows that it only by a law of freedom that there can be a world with a temporal beginning and a spatial boundary, while it is only by laws of causality that there is a world in an infinite causal series in time and space is possible. Therefore, the first antinomy is really an argument regarding freedom because the first antinomy's thesis and antithesis must presuppose either a law of freedom or laws of causality.

In order to understand the first antinomy's connection with freedom, the third antinomy begins with Kant making an argument for freedom where he argues that a world only under causal laws is impossible. Kant writes,

Assume that there is no other causality than the one according to laws of nature. In that case, everything that occurs presupposes a previous state upon which it unfailingly follows according to a rule...never a first beginning, and hence there then is on the side of the causes originating from one another no completeness of the series at all. The law of nature, however, consists precisely in this: that nothing occurs without a cause sufficiently determined a priori. Hence the proposition, in its unlimited universality, whereby any causality is possible only according to natural laws contradicts itself; and hence this causality cannot be assumed as being the only one.¹³

If a world is only under causal laws, then every event must presuppose a previous event which it follows from. But if every event follows from the preceding event, then there is an infinity of events where it is impossible for there to be either a beginning/end or a complete series of events. However, the absence of a beginning/end or complete series is problematic because this would contradict the a priori determination of causal laws. A priori causal laws require a complete causal event that begins with a cause and ends with an

effect. Therefore, a world only under causal laws would result in a world that violates the nature of its own causal laws. Kant concludes that a world only under causal laws is insufficient and requires a law of freedom. Turning to the first antinomy, Kant examines a world in an infinite causal series of time and space. Kant argues that such a world is impossible and that the world must have a beginning and a boundary. The importance of a world with a beginning and boundary would imply freedom since a beginning and boundary contradicts the infinite causal series generated by mechanical causality. In regards to time, Kant writes,

For assume that the world has no beginning as regards time. In that case, up to every given point in time an eternity has elapsed and hence an infinite series of successive states of things in the world has gone by. However, the infinity of a series consists precisely in the fact that it can never be completed by successive synthesis. Therefore an infinite bygone world series is impossible, and hence a beginning of the world is a necessary condition of the world's existence...¹⁴

Kant is arguing that if the world is infinite in time, then at any given point in time the world is both preceded by and followed by an infinite series of successive states that can never be completed. If this infinite series of past and future states of the world can never be completed, then it would be impossible to ever reference back to a past stage of the world since it would never be complete. There would then be multiple worlds, which is impossible since the world can only be conceived of as being one. Therefore, the world must have a beginning. Similarly in regards to an infinite world in space Kant writes,

Accordingly, in order for the world—which occupies all spaces—to be thought as a whole, the successive synthesis of the parts of an infinite world would have to be regarded as completed...an infinite aggregate of actual things cannot be regarded as a given whole, and hence also not as a given simultaneously. Consequently, a world is...not infinite but is enclosed in its bounds...¹⁵

In other words, if the world was infinite in space, then the world would have no boundary and would continue on infinitely and successively without completion. An infinite world would never be able to be conceived of as a whole since a whole world has a boundary that encloses it. An infinite world, which cannot be conceived of as a whole, is conceptually impossible since a world can only be thought of as one. Therefore, the world must have a boundary. By establishing a beginning and boundary of the world

¹³ Immanuel Kant, *Critique of Pure Reason*, trans. Werner S. Pluhar (Indiana: Hackett Publishing Company, 1996), A 444- A 446.

¹⁴ Immanuel Kant, *Critique of Pure Reason*, trans. Werner S. Pluhar (Indiana: Hackett Publishing Company, 1996), A 426.

¹⁵ Immanuel Kant, *Critique of Pure Reason*, trans. Werner S. Pluhar (Indiana: Hackett Publishing Company, 1996), A 428.

along with the impossibility of a world with only causal laws, a law of freedom seems to have been justified.

However as noted earlier, Kant does not secure the law of freedom as he immediately proceeds to provide the antithesis to each argument for freedom. This not only relegates freedom to being neither provable nor disprovable, but Kant goes on to conclude that freedom does not have any real bearing in nature or experience. Therefore, not only is freedom established as being uncertain, but freedom is supplanted in favor of causality since freedom is not an a priori concept nor does freedom ever manifest itself. Regarding the antithesis of the first antinomy, Kant addresses the argument of a world as having a beginning and boundary. In relation to time, Kant writes,

For suppose that it has a beginning. In that case, since the beginning is an existence preceded by a time wherein the thing is not, a time must have preceded wherein the world was not, i.e., an empty time. In an empty time, however, no arising of anything is possible; for no part of such a time has, in preference to another part, any distinguishing condition of existence rather than non-existence...¹⁶

If a world has a beginning, then there was a time when the world did not exist. If the world did not exist, then nothing existed in time. If there was nothing, then the world with a beginning is impossible since it cannot come out this nothingness. Kant is arguing that nothing cannot produce something, which is what a world with a beginning must presuppose. Therefore, the world must be infinite and there must be an infinite causal series. Following an infinite world in time, Kant turns toward a world with a boundary,

Now the world is an absolute whole, outside of which there is to be found no object of intuition, and hence no correlate of the world to which the world stands in relation; therefore the relation of the world to empty space would be a relation of it to *no object*. But such a relation—and hence also the bounding of the world by empty space—is nothing. Therefore the world is...infinite...¹⁷

If a world is whole and has a boundary, then anything that exists outside of the world is nothingness. If nothingness is outside of the world, then the world stands in relation to this nothingness. However, this nothingness is nothing, and so a bounded world is impossible because the world cannot stand in relation to something that is actually nothing. Therefore, a world with a boundary is impossible and the world must be infinite. After having argued for the possibility of an infinite world in time and space, Kant addresses the

possibility of a law of freedom in the antithesis of the third antinomy. Kant writes,

Suppose there is...a freedom as a special kind of causality according to which the events of the world could happen...not only will a series begin absolutely through this spontaneity, but the determination of this spontaneity itself to produce the series—i.e., the causality—will begin absolutely, so that nothing precedes by which this occurring action is determined according to constant laws. However, any beginning to act presupposes a state of the not yet acting cause; and a dynamically first beginning of action presupposes a state that has no connection of causality at all with the preceding state of the same cause, i.e., in no way results from that preceding state. Therefore, transcendental freedom runs counter to the causal law; and hence a linkage of successive states of efficient causes according to which no unity of experience is possible—and which, therefore, is also not encountered in any experience—is an empty thought-entity.¹⁸

If it is possible that there could be a causality of freedom, then that causal relationship must begin spontaneously and absolutely without a preceding event kick-starting it. This spontaneity and absence of a preceding event/cause applies not just to the causal relationship as a whole, but in the causal relationship itself. In other words, a regular causal relationship consists of the cause and the effect in which the effect is brought about because of the cause. However in a causality of freedom, the effect/action cannot be causally connected with any preceding state/cause because that would violate its freedom. Therefore, Kant concludes that a causality of freedom “runs counter to the causal law” and cannot maintain a cause and effect relationship within, so thereby it self-implodes. Additionally, Kant goes on to say that a causality of freedom would be unable to provide any unity in experience due to freedom’s condition of spontaneity, while also noting that there is unity in experience which means that freedom is never “encountered in any experience.” From this, Kant understands freedom to be “an empty thought-entity” because it is irrelevant to experience. Kant is clearly deemphasizing freedom by arguing that freedom at best is impotent and at worst it is disprovable. Although Kant does articulate arguments showing that freedom was neither provable nor disprovable, it is mechanical causality that is hoisted up as it is an a priori concept that is experienced in the world, providing coherence and unity. The first Critique establishes causality as being of imposition, and

¹⁶ Immanuel Kant, *Critique of Pure Reason*, trans. Werner S. Pluhar (Indiana: Hackett Publishing Company, 1996), A 427.

¹⁷ Immanuel Kant, *Critique of Pure Reason*, trans. Werner S. Pluhar (Indiana: Hackett Publishing Company, 1996), A 429.

¹⁸ Immanuel Kant, *Critique of Pure Reason*, trans. Werner S. Pluhar (Indiana: Hackett Publishing Company, 1996), A 445-A 447.

understands causality, not freedom, as being the primary process that structures the world.

Critique of Practical Reason and two causal relationships

In the *Critique of Practical Reason*, Kant approaches the statuses of causality and freedom entirely differently than the first Critique as Kant strongly argues for the possibility of freedom while still maintaining causality. Kant formulates an ethics centered on freedom and the conception of a free-will, but with a foundation consisting of two causal relationships. The first causal relationship is between the will and moral action, and the second causal relationship is within the will itself as a duality. The will consists of a legislative role and an executive role which Kant argues produces a free-will. Therefore, the foundation for a free-will and moral action is grounded upon causal relationships, and this stands in contrast to the relationship between causality and freedom in the first Critique. However, this newfound freedom and its relationship to causality will generate a problem of discontinuity between the two Critiques, particularly in regard to the first causal relationship between the will and moral action which is caught between freedom and nature.

Kant begins by examining the first causal relationship, the will as the cause and moral action as the effect. Kant writes,

For in the case of what is to be morally good it is not enough that it conform with the moral law, but it must also be done for its sake; if not, that conformity is only very contingent and precarious, because the immoral ground will indeed now and then produce action that conform with the law, but in many cases actions that are contrary to it.¹⁹

Kant is arguing that moral action can only be produced through an individual's will who has chosen to act intentionally for the sake of the moral law. Therefore, the will can be understood as the causal impetus of moral action. Kant justifies attributing moral action solely to the will by arguing that the alternative, action in conformity with the moral law, is inadequate. The reasoning for why conformity to the moral law is not a sufficient ground for a moral action is because conformity with the moral law can be produced by both moral and immoral intentions alike. If moral action is simply determined by conformity with the moral law, then it would be possible that a "moral" action is produced by two contradicting motivations that are

diametrically opposed to each other. This would be problematic. Furthermore, even if it can be granted that "moral" action can be reduced to conformity, a "moral" action motivated by immoral intentions would result in the moral law becoming a means toward an end, rather than an end in itself. The moral law cannot be a means toward an end because that would contradict the character of the moral law as having absolute necessity, being a priori, and requiring obligation. By recognizing the contradictions that conformity can produce, Kant emphasizes action done for the sake of the moral law and thereby introduces the role of the will as the cause of moral action.

From this understanding of the will and the will's role as the catalyst for moral action, it follows that the will must be determined by the moral laws. The reason why the will must be determined is that before the will has the capacity to engage in moral action, act for the sake of the moral law, the will must already be determined to know what the a priori moral laws are. Timmermann notes, "It follows that if a will effects changes it must be in accordance with causal regularities...A 'lawless will' is a conceptual impossibility—a will must always be determined to act by some law."²⁰ Timmermann recognizes that the will's causal role in moral action necessitates that the will is engaged in a causal relationship with laws that determine and effect the will. Therefore, the will must be lawful and have knowledge of the moral law.

Following the causal relationship between the will and moral action, Kant examines the foundation of moral knowledge. Kant argues it is through pure reason being practical or practical reason that moral action can be carried out. Kant writes,

Pure reason is practical of itself alone and gives (to the human being) a universal law which we call the moral law. The fact mentioned above is undeniable. One need only analyze the judgment that people pass on the lawfulness of their actions in order to find that, whatever inclination may say to the contrary, their reason, incorruptible and self-constrained, always holds the maxim of the will in an action up to...itself inasmuch as it regards itself as a priori practical.²¹

Kant understands pure reason to be practical because whenever an individual attempts to determine whether his or her actions are lawful, that particular maxim for that action is always assessed by one's reason. Kant argues that it is only through pure reason containing a priori moral laws and being practical that there is the possibility for people to be able to judge the lawfulness of their actions. Because "lawfulness"

¹⁹ Immanuel Kant, *Groundwork of the Metaphysics of Morals*, trans. Mary Gregor and Jens Timmermann (Cambridge: Cambridge University Press, 2012), 5-6.

²⁰ Jens Timmermann, *Kant's Groundwork of the Metaphysics of Morals* (Cambridge: Cambridge University Press, 2007), 123.

²¹ Immanuel Kant, *Critique of Practical Reason*, trans. Mary Gregor (Cambridge: Cambridge University Press, 1997), 29.

implies universal moral laws, then determining the lawfulness of actions necessitates that one has knowledge of moral laws, which is only through pure reason, and that reason be practical in order to assess whether that particular action is moral. Beck warns that if the validity of practical principles and maxims is not strictly derived from the a priori moral laws of reason, “then the internal unity of practice would itself be nonexistent or, at best, contingent.” Therefore, Beck argues that “only reason can supply universal and necessary principles, whether to knowledge or to conduct.”²² Pure reason must be practical so that the structure for the practice of practical principles and maxims is not tenuous, contradicting, or nonexistent. It is only from pure reason being practical, that practical principles and maxims have a foundation of absolute necessity, obligation, and universality, thus allowing people to judge whether maxims or actions are lawful.

After the premise that practical reason produces moral action, Kant elaborates on the laws of practical reason in moral action. Kant writes,

Practical principles are propositions that contain a general determination of the will...they are objective, or practical laws, when the condition is cognized as objective, that is, as holding for the will of every rational being. If it is assumed that pure reason can contain within itself a practical ground, that is, one sufficient to determine the will, then there are practical laws.²³

Kant is arguing that practical reason can produce practical laws for an individual in a particular situation. These practical laws have absolute necessity, are objective, and hold for the will of every rational being. In other words, because pure reason contains a priori moral laws that are universal and that have absolute necessity, then practical reason is able to produce practical laws that are derived from those a priori moral laws, and that are objective and universal. It is only from the practical reason that an individual is able to determine the lawfulness of a maxim and action, which is what is necessary for the will to know before it is able to produce moral action.

Kant concludes that if practical reason is the venue by which moral action occurs and that the will is lawful,

has knowledge of the moral laws, and is the cause of moral action, then the will is practical reason.²⁴ Kant writes, “Since reason is required for the derivation of actions from laws, the will is nothing other than practical reason.”²⁵ It is necessary for the will to be practical reason because if the will is not practical reason, then the ethical and causal relationship between the will and moral action will disintegrate. Kant writes,

If one thought of him only as subject to a law (whatever it may be), this law had to carry with it some interest by way of attraction or constraint, since it did not as a law arise from his will; in order to conform with the law, his will had instead to be constrained by something else to act in a certain way. By this quite necessary consequence, however all the labor to find a supreme ground of duty was irretrievably lost.²⁶

The ethical relationship between the will and moral action, in which moral action can only be produced by the will, is completely dependent upon the will being practical reason and having immediate knowledge of the moral law. If the will is not practical reason or does not legislate the law, then before the will can act for the sake of the moral law, the will must first be motivated by some interest or inclination. The reason why the will would have to be motivated by interest or inclination is because there must be some motivating factor that would cause the will to express concern for something external to it, the moral law. Therefore, if the will is not practical reason and is motivated by interest or inclination, then the causal relationship that Kant finds to be ethically necessary would be impossible. However, since Kant finds the causal relationship of the will acting for the sake of the moral law to produce moral action to be necessary, the will is practical reason and has a legislative role.

Understanding the will as legislative introduces the second causal relationship, which occurs within the will itself, between the legislative will and the executive will.²⁷ Kant writes,

The will is thought as a capacity to determine itself to acting in conformity with the representation of certain laws. And such a capacity can be found only in rational beings. Now what serves the will as the objective

²² Lewis White Beck, *A Commentary on Kant's Critique of Practical Reason* (Chicago: The University of Chicago Press, 1960), 47-48.

²³ Immanuel Kant, *Critique of Practical Reason*, trans. Mary Gregor (Cambridge: Cambridge University Press, 1997), 17.

²⁴ Lewis White Beck, *A Commentary on Kant's Critique of Practical Reason* (Chicago: The University of Chicago Press, 1960), 39. The assertion that the will is practical reason seems to be contradictory after Kant clearly indicated that the will is determined by practical reason. Beck notes this confusion by observing that Kant “often confuses the reader by speaking of reason as the determiner of the will,” while also identifying “the will with practical reason.” However, the conception that the will is practical reason is a crucial component for the will’s duality and for establishing the will as being free.

²⁵ Immanuel Kant, *Groundwork of the Metaphysics of Morals*, trans. Mary Gregor and Jens Timmermann (Cambridge: Cambridge University Press, 2012), 26-27.

²⁶ Immanuel Kant, *Groundwork of the Metaphysics of Morals*, trans. Mary Gregor and Jens Timmermann (Cambridge: Cambridge University Press, 2012), 45.

²⁷ Henry E. Allison, *Kant's Theory of Freedom* (New York: Cambridge University Press, 1990), 130. This observation is recognized by Allison who understands that “Kant not only defines the will as practical reason, he also speaks of reason as determining...the will.” Allison argues that this results in “a certain duality of function within the will.” The legislative will is practical reason while the executive will is being determined by practical reason or the legislative will.

ground of its self-determination is an end...a supreme practical principle and, with respect to the human will, a categorical imperative...it is an end in itself, it constitutes an objective principle of the will and thus can serve as a universal practical law.²⁸

There is a self-determining causal relationship within the will in which the legislative will is the cause that determines itself, or the executive will, to act in conformity with the representation of a priori moral laws. The synthesis of the representation of a priori moral laws that determines the executive will, is through the practical law of the legislating will known as the Categorical Imperative. Kant understands this practical law to carry the same character of a priori moral laws, universality, absolute necessity, an end in itself, and holding for all rational beings and their will. The Categorical Imperative operates to determine whether a maxim or an action is moral by analyzing whether or not the maxim can be a representation of a moral law. The Categorical Imperative provides several stipulations that a maxim or action must satisfy in order to be moral, they must be objective, universal, an end in itself, and able to be made a universal law without contradiction. These qualities that are required of subjective maxims and actions are important because they are what characterize a priori moral laws and which ultimately leads to moral action or actions that are in conformity with the representation of a priori moral laws. Reath notes that because “a maxim is always the subjective principle of some agent” and is not yet a practical law, the Categorical Imperative operates to determine “whether a proposed maxim can be made into a practical law.” For it is only “by showing that your maxim can be willed as a universal law and adopting it on that basis,” that that “subjective principle meets conditions of universal validity” and can be a practical law, generating moral action.²⁹ Therefore, the causal relationship between the legislative will and executive will encompasses the Categorical Imperative of the legislative will as the causal force that generates moral action in the executive will. It is through the Categorical Imperative that the legislative will is able to determine the executive will to a moral action that is in conformity with the representation of a priori moral law.

Despite this causal relationship between the legislative will and executive will, Kant argues that this

causal relationship produces freedom and a free-will. Kant writes,

Since the mere form of a law can be represented only by reason and is therefore not an object of the senses and consequently does not belong among appearances, the representation of this form as the determining ground of the will is distinct from all determining grounds of events in nature in accordance with the law of causality, because in their case the determining grounds must themselves be appearances. But if no determining ground of the will other than that universal lawgiving form can serve as a law for it, such a will must be thought as altogether as independent of the natural law of appearances in their relations to one another, namely the law of causality. But such independence is called freedom...Therefore, a will for which the mere lawgiving form of a maxim can alone serve as a law is a free-will.³⁰

Kant's argument for freedom is based on a differentiation that he believes exists between the causality in the will versus the causality in empirical nature. According to Kant, the causality of the will has its determining ground only in the form and representation of the moral law, and not in the production of appearances.³¹ Korsgaard notes this by stating that practical reason's law has “no constraint on the will's choice...the only constraint that it imposes on our choices is that they have the form of law.”³² On the other hand, the causality of nature can be interpreted as the first Critique's concept of causality as being mechanical and of imposition. A mechanical causality is concerned with the immediate and necessary production of appearances, which Kant found to be incompatible with freedom. Kant argues that this new concept of causality in the will is independent of nature's law of causality, a causality of imposition, allowing for freedom in the will. However, what is important to note is that Kant still acknowledges and thereby maintains a causality of imposition in nature by differentiating between this new conception of freedom in causality versus nature's causality. This attempt to maintain a causality of imposition will be problematic. However in regard to this freedom, Beck argues that “the concept of freedom and that of a universal practical law reciprocally imply each other” because “we are directly aware of the binding quality of a universal law,

²⁸ Immanuel Kant, *Groundwork of the Metaphysics of Morals*, trans. Mary Gregor and Jens Timmermann (Cambridge: Cambridge University Press, 2012), 39-41.

²⁹ Andrews Reath, *Agency & Autonomy in Kant's Moral Theory* (New York: Oxford University Press, 2006), 110.

³⁰ Immanuel Kant, *Critique of Practical Reason*, trans. Mary Gregor (Cambridge: Cambridge University Press, 1997), 26.

³¹ Henry E. Allison, *Kant's Groundwork for the Metaphysics of Morals* (New York: Oxford University Press, 2011), 130. Allison comments upon the possibility of freedom in respect to the legislative will by pointing out that, Kant makes a crucial distinction

in claiming that it is the representation of a priori moral laws that determines the will rather than a priori moral laws themselves immediately determining the will. This is important because it allows for the possibility that a rational being has the free-will to act or not act in accordance with the representation of a priori moral law. Allison notes that this distinction emphasizes Kant's desire to maintain a free-will and “rational agency...as a free, self-conscious act.”

³² Christine M. Korsgaard, *Creating the Kingdom of Ends* (New York: Cambridge University Press, 1996), 25.

for we have it presented to us in our consciousness of the moral law,” yet the individual still has the freedom to consciously choose to not act for the sake of the law.³³ Furthermore, Allison notes that this ability of “the will as giving the law to, or even being the law for, itself,” generates the “the property of autonomy.”³⁴

In conclusion, Kant understands the legislative will’s causality upon the executive will, via the moral law, to only be that of an “ought” rather than an immediate “doing.” Thus the moral law generates the possibility of freedom for the will, since it is through the moral law that the executive will recognizes that it has the freedom to either act or not act for the sake of the moral law. This ability to act and to recognize that the law is given to itself generates the property of autonomy. Unlike the first Critique, in the second Critique Kant makes an argument for definite freedom which he then takes as being conclusive. Kant still maintains causality, however the power that causality had in the first Critique/nature has been modified and lessened in the second Critique through the new conception of causality in the will which produces freedom. However as noted earlier, Kant still acknowledges and thereby maintains a causality of imposition in nature. This conception of mechanical causality will be problematic for the second Critique, particularly between the first causal relationship and its interaction with the world.

Causality as regularity

The problem between the first Critique and second Critique emerges because the first causal relationship of the will and moral action is caught in between freedom/choice and mechanical causality. The first causal relationship is structured upon freedom and choice, via the second causal relationship within the will, and yet the first causal relationship also occurs in the world of nature and must abide by the a priori concept of causality that structures experience. The second Critique’s freedom and choice is regarded by the first Critique as an absurdity because it violates the a priori concept of causality that was established. Kant understood the world and experience to be structured by the a priori concept of causality and recognized that the very possibility of the world, experience, and reality was only through the a priori concepts, one of which included a mechanical causality. Therefore, “anything” that violates the a priori concept of causality could not actually be anything at all. There the problem of discontinuity is presented between the second Critique’s freedom and choice and the first Critique’s mechanical

causality. In order to resolve this problem, Bencivenga argues that nature’s causality cannot be a causality of imposition, but must be understood as a causality of regularity in order for the second Critique to resolve this dilemma between freedom and nature.

Bencivenga begins by providing an example of causality as regularity in terms of a chess game. Bencivenga argues that if one was to account for a singular event in a chess game in terms of a causality of regularity, such as a particular move of a chess piece, then there are multiple and equally valid explanations. There are physiological explanations such as the nervous system and muscular system in which both systems interact with the other to coordinate movement. There are psychological explanations such as one’s strategy or one’s knowledge of the game that influences the particular move. Thirdly, there is an explanation that relates directly to the rules of the game and the particular situation within the game where it can be argued that such a move was the rational move to make. If asked to provide an explanation for the particular move, Bencivenga argues that a causality of regularity allows for one to explain the move in terms of “a natural pattern...integrated in the one spatiotemporal nature,” while also explaining the move “in a pattern of rationality: that they are the moves one would have to make under the circumstances.”³⁵ Bencivenga concludes that since “freedom turns out to be autonomy—that is, being guided by an inner, intrinsic law—and autonomy turns out to coincide with rationality” then a move that was “such that reason could recognize itself in it...could be called an autonomous, and hence a free one.”³⁶ In other words, if the second Critique’s causal relationship between the will and moral action is under a causality of regularity, then the event can be explained in terms of Kant’s epistemology that projects the appearance in space and time, but the event could also be explained in terms of rationality and freedom. However, this solution is only possible if the second Critique is operating on the terms of causality as regularity rather than the first Critique’s mechanical causality. If the second Critique breaks from the first Critique’s conception of causality, then the first causal relationship between the will and moral action can take place in the world and therefore follows a structured pattern, but reason is also to recognize itself in this relationship and so freedom is possible. Kant must change the terms of causality from mechanical to regularity in order to have a cohesive argument for ethics and freedom. If causality is no longer that of imposition, then it is possible to explain the first causal

³³ Lewis White Beck, *A Commentary on Kant’s Critique of Practical Reason* (Chicago: The University of Chicago Press, 1960), 73.

³⁴ Henry E. Allison, *Kant’s Theory of Freedom* (New York: Cambridge University Press, 1990), 130-131.

³⁵ Ermanno Bencivenga, *My Kantian Ways* (Berkeley: University of California Press, 1995), 36-37.

³⁶ Ermanno Bencivenga, *My Kantian Ways* (Berkeley: University of California Press, 1995), 37.

relationship between the will and moral action in general patterns of nature and in terms of freedom.

In conclusion, the change in the conception of causality allows Kant's ethics to be a consistent and effective structure while avoiding contradictions that would have otherwise been produced. Causality as regularity provides the possibility for the second Critique to establish the freedom that it finds to be necessary while still maintaining some semblance of causality that the first Critique finds to be necessary. However, the causality of the second Critique is only a semblance of the first Critique's causality as the change in the conception of causality leads to the consequence that each Critique is operating under different terms. A drawback toward each Critique operating under a different concept of causality is that the arguments that are constructed in regards to freedom's possibility are two different arguments, one dealing with freedom and mechanical causality and the other dealing with freedom and causality as regularity. Despite this drawback, it is necessary to understand the second Critique in terms of causality as regularity because without this change, Kant's deontological ethics would disintegrate as it would be impossible to will for the sake of the moral law. Furthermore, despite the difference in terms of causality, the first Critique and second Critique are still consistent with one another by virtue of the fact that they are solving two different arguments. Because there are two different arguments, the two Critiques do not contradict each other as each argument produces a different outcome. By changing the concept of causality, both two Critiques are able to successfully operate in their respective spheres, epistemology and ethics.

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The railroad's geographic impact on the Battle of First Manassas/Bull Run

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Abstract

The purpose of this research is to identify and explore the short-term and long term impacts of railroad use in the American Civil War. In this particular project, the battle of First Bull Run or First Manassas will be the centerpiece in examining the multiple points of impact the Manassas Gap Railroad had on this early-war conflict in terms of geography and logistics. The railroad is widely regarded as one of the keystones in the Union's victory over the Confederacy in 1865. The two opposing governments treated the railroad in different fashions which created a dichotomy of how effectively the two parties were able to utilize the iron horse. Despite the consensus on the important role the railroad played, is its role still understated to this day? In order to examine this issue, the actual historical event of Manassas I is analyzed, identifying how the railroad was employed in this battle, its impact on the geographic location of the conflict, the advantages it provided to each respective combatant, and what might have been if the railroad had not been a key part in bringing this battle to pass. Through the detailed exploration of this topic, one can discover that the railroad not only impacted the logistical aspect of the war but also the geography.

Keywords: U.S. Civil War, railroads, military history, First Bull Run, First Manassas

Introduction

There is a general consensus on the idea that the railroad played an enormous role in how the American Civil War was fought. The impacts of this technological development include decreasing the amount of time to move troops, greater supply capacity, and the ability to move over longer distances. For example, one wonders whether William T. Sherman would have been successful in his conquest of Atlanta without the Chattanooga Railroad to support his advance, a conquest that proved instrumental in the re-election of Abraham Lincoln. In the words of renowned historian James B. McPherson "The impact of this event cannot be exaggerated."¹

The question remains, however, whether the railroad still not given as much credit for the role it played in the American Civil War? ¹ This article examines the effects that the railroad had on the geography of the conflict, specifically during the battle of First Manassas/First Bull Run and how the geography influenced where and when the battle was fought. The concept of what might have happened if the railroad did not exist in that area is also discussed in order to further examine how the iron horse played a role in the outcome in the first major clash of the American Civil War.

The Battle

In early July, after Lincoln's call for volunteers to fight against the Confederacy, there was tremendous public pressure in the North for an advance to Richmond. After George B. McClellan's recent victories in relatively small contests in what is now West Virginia, the path seemed more open than ever. Irvin McDowell was the man in charge of the Army of the Potomac at this point in time. He was reluctant however because many of the 90-day enlistments from right after Fort Sumter were near expiration, making him nervous that these troops would be less effective at fighting. His army consisted of about 35,000 soldiers and officers who made their way down the Warrenton Turnpike to face Pierre G. T. Beauregard's Confederate army of 20,000 troops who were station at Manassas Junction.

An important component to the overall Union plan was for General Robert Patterson's army of 15,000 to pin down Joseph E. Johnston's 11,000 soldiers in the Shenandoah valley about 40 miles west of Manassas Junction. This part of the plan was to prevent the likelihood of Johnston reinforcing Beauregard once McDowell moved against him. As it ended up, later renowned Confederate cavalry commander J.E.B. Stuart was able to set a screen for Johnston, allowing the

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¹ McPherson, J. M. (2003). *Battle Cry of Freedom*. New York: Oxford University Press.

latter to retreat his troops down the valley to Piedmont where the Manassas Gap Railroad waited to take them east to Beauregard.

McDowell's tactical plan consisted of a flanking attack across the river Bull Run on the Confederate's left flank which actually succeeded in surprising Beauregard who had expected the attack to come along the railroad on his army's right flank. However, the one brigade that opposed the Union advance was able to stall them long enough for some reinforcements to arrive from the South's right flank. After heavy fighting all day around the Henry House Hill, in which the legend of Stonewall Jackson was born, the Union attack had stalled. At around 3:45 in the afternoon, most of the reinforcements from the Shenandoah valley had arrived and Beauregard ordered a general counterattack. This proved to be the final straw as the Union troops, unnerved by the shrill rebel yell, the appearance of fresh enemy troops, and an exhausting day of fighting, began to melt away, eventually turning into a rout. Both Beauregard and Johnston believed their own troops too disorganized for any kind of pursuit, leaving the Army of the Potomac to retreat and lick its wounds. The result of the battle: a resounding Confederate success.

The railroad and its significance

The site of the heavy fighting around the Henry House Hill was only a mile or so from the Manassas railroad junction where the Manassas Gap Railroad, running east from the Shenandoah Valley intersected the Orange and Alexandria Railroad which was headed south to Gordonsville, Virginia, where it became the Virginia Central Railroad. This railroad then ran east straight into Richmond, the capital of the Confederacy.

The Shenandoah Valley was known throughout the war as being a significant source of foodstuffs and supplies for the Army of Northern Virginia as well as the Richmond area in general. It operated in this function even late in the war until Philip Sheridan came through in 1865 and wasted it after the manner of William T. Sherman's March to the Sea.

Although none of this had happened at this point in the war, it remains evident that the Manassas Gap Railroad was important for several reasons. The first reason was that by use of this railroad line, food and supplies could be freighted from the Shenandoah Valley to the Confederate Army of the Potomac.² These supplies could also be moved southward to the Richmond area via the Orange and Alexandria. This route, as stated earlier, remained an important well from

which the Confederacy's production center could draw nourishment.

The second reason that the Manassas Gap line was important is based on the idea of troop transport. As one can see by looking at a map of the disposition of Beauregard and Johnston's troops (Figure 1), they had a gap of almost 40 miles between them. Johnston and his 11,000 soldiers were stationed in the Shenandoah to protect the crops and animals from the Union army under Robert Patterson. Beauregard was stationed southeast of him at Manassas Junction, right where the Manassas Gap Railroad intersected the Orange and Alexandria. This position allowed him to guard against any Union advance south, whether it be directly toward him or down the Potomac River. This link of railroad acted almost as a tether from which both Confederate armies could support one another at will. In this particular case, Johnston was actually able to use the railroad to move his troops to the aide of Beauregard as we read earlier, helping sway the tide of battle in the South's favor.

The Union's perspective

The North's battle cry at this point in time was "Forward to Richmond!"³ Public opinion was that the Union armies should march straight through any opposition and end the war directly. George B. McClellan had helped pave the way for this mode of thinking through his early victories in relatively small engagements the mountains and hills of western Virginia.

The most direct overland route to accomplish this was straight south along the Potomac River. McDowell's army could either march straight to Fredericksburg or first go to Aquia Landing on the Potomac and strike out for Fredericksburg from there. Once at Fredericksburg, one only had to follow the Richmond, Fredericksburg, and Potomac Railroad or the Richmond road, which ran parallel, in order to interrupt the South's plans for a new capital.

The problem with this plan was that it would leave Washington exposed and Beauregard would be able to cause a significant amount of panic if not capture the city outright. Throughout the war Lincoln was very particular about protecting the North's capital. He recognized that if it fell, Northern support for the war would plummet. Great Britain would also probably intervene in the conflict and France would follow suit. This exposure of the North's vitals would not have been allowed by the President.

² Later known as the Army of Northern Virginia

³ New York Daily Tribune, June 26, 1861

Some of this reasoning was partly based on the fact that the Confederacy's capital had moved from Montgomery, Alabama to

Richmond, Virginia where its Congress was to convene for the first time on July 20th.

There was also a small Confederate force located at Aquia Landing that would have alerted Beauregard of any movement that far south. Another deficiency of any troop movement along the Potomac is that McDowell would likely be trapped with his back up against the river. Military security was not top-notch during the Civil War and southern generals often knew what their counterparts were up to due to these breaches. Indeed, Beauregard was warned of McDowell's movement out of Washington before First Bull Run. If McDowell had marched along the Potomac River, it would have been too easy for Beauregard to pin him up against it and subsequently destroy the North's fighting capabilities in the Eastern Theater.

Lincoln and his generals heard the calls for direct action and knew something had to be done that would not jeopardize the entire country like marching straight to Richmond would. Therefore it made sense to go by way of Manassas junction for a variety of reasons.

Advancing by the Orange and Alexandria with a smaller contingent near Harper's Ferry to pin down Johnston's force made much more sense compared to risking defeat and the capture of Washington. This route provided protection on McDowell's left flank because Beauregard would not attempt to maneuver around that side and risk getting trapped against the Potomac himself. Moving toward Manassas also placed pressure on Beauregard and Johnston whose troops were 40 miles away from each other. Beauregard would either be forced to stand and fight an army 15,000 soldiers stronger or retreat and lose the crossroads so important to linking Richmond and the Shenandoah Valley. Retreating from this position would also leave Joseph E. Johnston in an over-extended position vulnerable to attack by McDowell from the east who would be able to utilize the Manassas Gap Railroad to possibly move in on Johnston's right flank and cut off any escape as Patterson pressured him from the north end of the Shenandoah valley.

Another advantage this rail-line had to offer to McDowell was the idea of being able to supply his own army with crops and food from the Shenandoah while denying the rebels the privilege of doing so at the same time. If he captured this line it would serve as a supply line to support his army advancing toward Richmond. This would supply much of the hay needed to feed the horses and mules used to pull the supply wagons that accompanied every army in that day. As it was, Beauregard decided to stand and fight, Johnston was able to get away under the nose of Patterson, and the South won the battle of First Manassas.

No Railroad?

From this exploration of the various options that the North and South both had in terms of during the days leading up to the battle of First Bull Run, it is apparent that the railroad played a very large factor in influencing each side's decisions. What would have been the case if the Manassas Gap Railroad had not existed at the time or, indeed, if there were no such thing as a railroad for that matter?

This hypothetical alteration of history changes many facets of the battle, perhaps even the outcome. While much conjecture goes into this exercise, it is still based on historical facts that lend it a certain air of validation.

One of the most important elements of the battle is its location. Where would have the battle been fought if not for the railroad? Perhaps there would not even have been the battle of First Manassas or First Bull Run. Based on the methods of logistics and supply one should look at the water ways and roads of the Maryland-Virginia area to deduce the most likely location a battle would have taken place at.

As one looks at the roadways that sprawl over the northern Virginia landscape, several epicenters stand out. These being Fredericksburg, Fairfax⁴, Warrenton, and Front Royal and Winchester in the Shenandoah Valley. Front Royal would not have been probable for the entire Confederate force to be located at which would have left them in an exposed position. It would have been more likely that Johnston would be split from Beauregard to occupy this relatively same position that he did in reality. Winchester, was where Johnston camped in the valley but this position would have been much more forward and unable to support Beauregard in case of attack.

Assuming that Johnston posted up at Front Royal, Beauregard would have three options left: Warrenton, Fairfax, Fredericksburg. Another position that could be considered would be at Centreville, not far from Manassas Junction. However, this would be quite close to Washington D.C. and without the railroad, Johnston would not be able to arrive in time to help Beauregard in the case of a battle. And since the Union would most likely have consolidated their troops in this scenario, Beauregard would have been vastly outnumbered. Thus, Fredericksburg, Warrenton, and Fairfax make the most sense since they are not in such an extended position.

Warrenton makes the most sense out of these remaining options simply because it is closer to Front Royal than Fredericksburg and Fairfax while also being in a strategic position. If Beauregard was located in Fredericksburg, he could defend an approach to

⁴ Not to be confused with Fairfax Courthouse located on the outskirts of Washington D.C.

Richmond well especially being located at a river, which would make it even harder for the Union to successfully attack him as General Ambrose Burnside found out at the Battle of Fredericksburg in the December of 1862. However, he would be leaving a very large gap between himself and Johnston through which the Army of the Potomac could slip through and cut off Johnston's escape routes and destroy his army.

If Beauregard was at Fairfax he could both defend a Union advance straight down the Potomac river while supporting Johnston in the Shenandoah Valley at the same time and vice-versa. However, Warrenton, about 12 miles southwest of Manassas Junction seems to be a better location than Fairfax. Fairfax would have been a rather recessed position that might have allowed the Union army to still get in between Beauregard and Johnston. This position would also allow the Union armies to roam around most of northern Virginia. If Beauregard moved up to Warrenton, it would still allow the same advantages as being at Fairfax while removing some disadvantages.

Too green?

One must also wonder what the Union general, Irvin McDowell, would have done without the added dimension of the railroad. The federal government was under pressure. The press and public were bolstered by the recent successes of George B. McClellan in western Virginia in a series of small battles. McDowell felt this pressure acutely and offered the idea that his troops were not yet ready for battle. Unfortunately for him, Lincoln recognized the need for some sort of action and induced McDowell to get moving.

Without the railroad one feels that any movement that the North made against the Confederates would be fully directed at the destruction of their Army of Northern Virginia. Without any strategic point other than the Shenandoah Valley, it is likely that the Army of the Potomac would have had Lincoln's full blessing to set its main objective as destroying the opposing army rather than try to use the supplies and crops in the valley. Moving down or alongside the Potomac to Aquia Landing and from there to Fredericksburg would have had no significance other than to somewhat expose Washington to an attack from both Johnston and Beauregard. Without a railroad, Fredericksburg would not have had very much strategic value other than being along the direct path to Richmond. No railroad here also meant that any offensive towards Richmond from here

would be much more difficult to supply with just the use of wagons.

With these assumptions, it would be reasonable to believe that McDowell would have likely pursued Beauregard no matter where he was. However, with Beauregard and Johnston likely being closer to each other, it is debatable whether the outcome of the first major battle of the American Civil War would have been any different given the pressure on McDowell and his deficiencies as an army commander. It would also be determined by the geography of the battlefield itself and the subsequent plans of attack or defense but that is another area that is open to exploration.

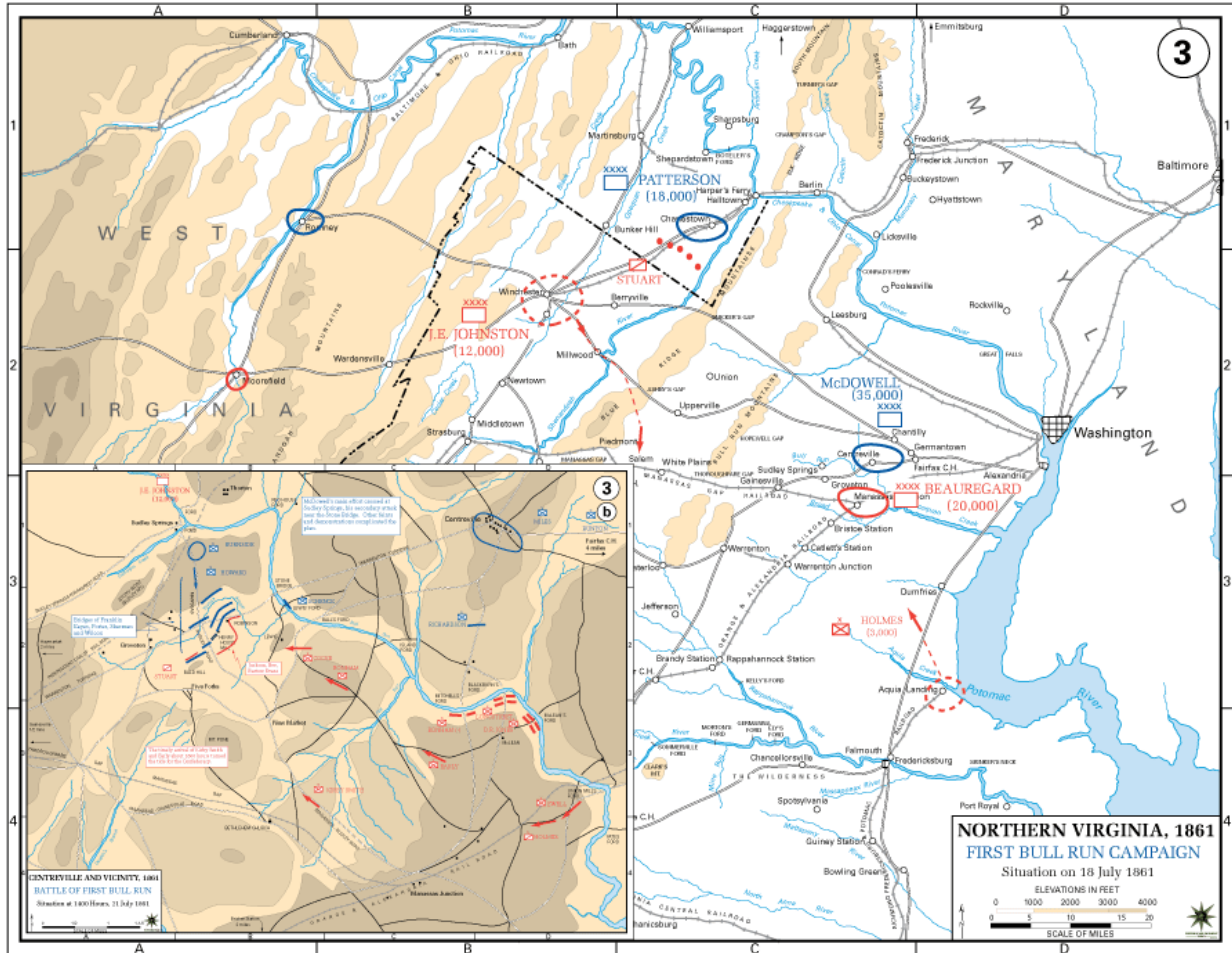
Conclusion

As we can see from this exploration of what might have been, the railroad had a huge impact on the goals and positions of the various commanders of both the North and the South. Without the railroad, Beauregard and Johnston would probably have not occupied the same areas they did in reality simply due to the fact that they would need to be closer to each other in order to support each other. This would be dictated by which towns were the convergence points for the sprawling road network in Northern Virginia. One might argue that the railroad was the reason some of these selected towns such as Front Royal, Warrenton, Fairfax, and Fredericksburg were where many roads collided. This could very well be true, but it also highlights how the railroad affected and impacted the geography of the American Civil War.

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Figure 1: Northern Virginia, 1861, First Bull Run Campaign



after <https://bullrunnings.wordpress.com/tag/west-point-atlas/>

Social discrimination against people with albinism

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Abstract

People with albinism have faced different forms of discrimination due to their genetic condition called oculocutaneous albinism. Oculocutaneous albinism, also known as OCA, is a genetic condition that results in people with low skin pigmentation and melanin levels in their hair, skin, and eyes to varying degrees. People who are afflicted with OCA have a high percentage of visual impairment and life-threatening sensitivity to the sun. Affected individuals also face negative outcomes of social, cultural, and economic prejudice because of the lack of color that their skin provides. People with albinism are shunned by the rest of their community and are at a high risk of being killed because of their unique physical features. The most common location where people with albinism are discriminated against is in Africa. In this exploratory study, research was conducted by interviewing four people with albinism to get an understanding of the social discrimination they faced. In these in-depth interviews, the focus was on the social aspect of their past and present lives and how they go about addressing any positive and/or negative outcomes they face in society because of their genetic condition. In addition, undergraduate students were surveyed from different fields of study to get an understanding of how much knowledge students have about albinism and its social aspects. Some of the majors surveyed include: biology, sociology, psychology, and liberal studies. The survey consisted of nine questions that were either multiple choice or true or false. The results of this research show that the people with albinism that were interviewed for this research have faced social discrimination within the societies they live in. The people that were interviewed were also from different locations in the country. The goal of the study is to bring awareness to the social struggles that people with albinism face in their everyday lives.

Keywords: Albinism, discrimination, blindness

Introduction

People with albinism (PWA) have faced different forms of discrimination due to their genetic condition called oculocutaneous albinism. Oculocutaneous albinism, also known as OCA, is a genetic condition that results in people with low skin pigmentation and melanin levels in their hair, skin, and eyes to varying degrees. People who are afflicted with OCA have a high percentage of visual impairment and life-threatening sensitivity to the sun. Affected individuals also face negative outcomes of social, cultural, and economic prejudice because of the lack of color that their skin provides. People with albinism are shunned away by the rest of their community and are at a high risk of being killed because of their unique physical features. The most common location where people with albinism are discriminated against is in Africa. In this exploratory study, research was conducted by interviewing four people with albinism to get an understanding of the social discrimination they faced. In these in-depth interviews, the focus was on the social aspect of their past and present lives and how they go about addressing any positive and/or negative outcomes they face in

society because of their genetic condition. In addition, undergraduate students from different fields of study were surveyed to get an understanding of how much knowledge students have about albinism and its social aspects. Some of the majors surveyed include: biology, sociology, psychology, and liberal studies. The survey consisted of nine questions that were either multiple choice or true or false. The results of this research show that the people with albinism that were interviewed for this research have faced social discrimination amongst the societies they live in. The people that were interviewed were also from different locations of the country. The goal of the study is to bring awareness to the social struggles that people with albinism face in their everyday lives.

Thesis

I am working on albinism to determine how they are socially discriminated against. In doing so, I hope to better understand the social, cultural norms, and expectations of people with albinism. I am going to go about it by interviewing people with albinism to discuss their personal situations. I expect my work will show

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that any type of prejudice or discrimination against people with albinism leads to the social, cultural, and political issues of affected individuals.

Literature review:

Myths/ Witch craft/ cultural beliefs

There are many common beliefs and myths that are associated to albinism in today's society. In an African society, when a baby with albinism is born, nurses are expected to talk to the mother of the baby with albinism to help ensure that the mother feels okay now that she has a baby with albinism. After labor, coming home to the husband and family is a difficult state of mind to be in. The majority of African American husbands of the baby with albinism usually blames the mother for cheating on him with another man, such as the tokolosh, or a malevolent spirit from Shona folklore which can be called upon to cause trouble for other people (Baker et al, 2010). In some cases, the husband will assume his wife has slept with a white man because of the pigmentation of the baby with albinism (Lund 2001). This results in the mother being in an abusive relationship, as well as dealing with the consequences that people believe it is her and her family's fault for having a baby with albinism (Lund, 2001). With these accusations, it is common for fathers to tell the mother to abandon, kill, or leave the baby to starve due to cultural beliefs and norms.

There are some myths such as, "people with albinism having magical superpowers, they can cure diseases like HIV, the devil stole the original child and replaced it with a person with albinism, and albinism is caused by a missing top layer of skin" (Cruz-Inigo et al, 2010). To add on, as tokolosh is indicated as an evil spirit, there are cultural beliefs that witchcraft is an essential way of killing PWA's to take their body parts in order to use for "magic" purposes, such as witchcraft potions (Brilliant, 2015). In other cases, there are marketers who sell albinism body parts that make charm bracelets because they are assumed to bring wealth and fortune to other individuals who have an albinism fetish or believe the myths (Burke et al, 2014). An incident that was reported on January 18th of 2015 stated that, "The body of Malita Makolija was found with head, arms and legs missing, buried near an anthill. She was 68 and had albinism" (Under the Same Sun, 2015).

Furthermore, the common myth in Africa is the fear of people with albinism being contagious. Families have kept their children away from children who have albinism because there is a fear that their child will become contagious and become a person with albinism as well. This proves a big problem knowing that people are believing in the myth that albinism is a sort of physical disability (Baker et al, 2010). The non-supportive societies and ideas in Africa believe that this

genetic disease can spread throughout Africa in no time because there is no treatment to prevent albinism from spreading (Baker et al, 2010). With that being said, those who are opposed to people with albinism consider that anything a person with albinism touches can be contaminated and poisoned, so it is important to keep away from them.

Another cultural myth is that people are spitting at those with albinism to help prevent any PWA being born within their families and to stay safe from the albinism community. The people that are most likely to spit at people with albinism are pregnant women, to ensure that her offspring will not come out as a PWA (Baker et al, 2010). With many common myths, PWA's are left to be isolated and turned away from their communities due to superstitions, cultural beliefs, and witchcraft.

Children

People with albinism face a challenging life; however, children are faced with discrimination more than others. The struggle for children is the lack of education in schools. Teachers and staff tend to stay away from children who have albinism due to the myths that PWA's are contagious (Lund, 2005). This is an issue that children will grow up to have little to no potential when living in a community where there is no support from the members of that population. In some instances, some children affected with albinism are not allowed to attend school (Baker, 2010). Since the majority of children with albinism cannot attend school, parents leave their children at home where it is safe to keep them where they will not be discriminated against. According to Lund, students from South Africa who are educated, attend special schools in order to help with their visual impairments (Lund, 2001). These special schools are to enhance how to be responsible and learn how to deal with their low visual impairment disabilities. Students who attend these schools are still able to fall back on school work because they are facing challenges of their visual impairments as well as being bullied by others who do not have a similar skin color as they do. Children with albinism are forced to be alone and others are expected to stay away from them because students are scared that children with albinism can be contagious. The most common bullies are the teachers. Teachers assign children with albinism to sit in the back as far as possible. For example, a teacher who was pregnant and feared that her baby would come out as albinism, so she placed the albinism student in the back of the class for the rest of the year (Metcalf, 2003, 139). On the other hand, students who are in poverty, are not able to attend special schools because they are in poor living conditions and communities. Another incident that was reported was in Malawi. The incident report states that, "On January 5, 2015, Mina Jeffrey was kidnapped by

three men, in Machinga district, Saiti Village. One of the kidnappers was her uncle. The 11-year-old managed to escape the men and was found. As a consequence of the incident, eleven school children with albinism have dropped out of different schools in the area, due to fears for their safety” (Under the Same Sun, 2015). Children with albinism who leave school may not get the same education as children who do not have albinism. With not enough education, children with albinism have a less likely chance of getting the job or career they want, or to even understand the basic necessities that involve education in their everyday lives.

Medical issues

There are two Oculocutaneous albinism types that are known: tyrosinase-negative (OCA1) and tyrosinase-positive (OCA2). According to Brilliant who is a researcher at Marshfield Clinic Research Foundation, “OCA1 is caused by a reduction or complete lack of activity of the tyrosinase enzyme encoded by the TYR gene. OCA2 is caused by a reduction or complete lack of activity of the P protein-a chloride channel that helps regulate the pH of the melanosome organelle where tyrosinase is active” (Brilliant, 2015). Within the two types of OCA, OCA2 is seen the most in African societies (van der Westhuizen, 2015). That being said, albinism is a genetic condition that can affect any individual of a family within a race, ethnicity, or gender. It is common to have two normal pigmented carrier parents to have an albino baby (Lund, 2005). Even though both parents carry the gene and do not have albinism, there is a high chance of their offspring having albinism. According to a study in Africa by Lund, “...the 35 villages visited in this study, 26 (74.3%) had at least one person with albinism” (Lund, 2007). With the population increasing, people with albinism are becoming aware of other medical and healthcare issues.

Studies have shown that people with albinism are more likely to face skin cancer as their age range develops throughout the years (Kromberg, 1989). With skin cancer, there are also freckle lesions that appear much more throughout the years, which distinguish the difference between people with albinism and other African Americans. People with albinism cannot afford to purchase sunscreen to help prevent skin cancer (Brilliant, 2015). This means that there are poor communities who have a higher rate of those with albinism. In the albinism community, they have low socioeconomic statuses, resulting in not having a sufficient amount of sunscreen to cure the skin cancer they are developing over their age range. With skin cancer, people with albinism do not live more than 30 to 40 years of age, leaving the albinism communities to shrink year after year. Although albinism is not curable, it is ideal that sunscreen is used to help maintain the skin cancer of the individuals (Lund, 2005). In other

impoverished areas of Africa, sunscreen is not available for purchase, making it difficult for affected individuals without access to healthcare resources. Within the impoverished communities, they are suggested to stay indoors and keep away from sun light as much as possible. With the help of little to no sun light, it is easier to maintain their skin cancer free without the use of sunscreen and not having to worry about how they can afford any treatment.

Social discrimination

Within areas of Africa, albinism is a common cause of discrimination. People with albinism are not seen as similar as others. They are instead seen as ‘different’ than those who are a part of the African population. People with albinism are expected to exclude themselves from the educational system, employment opportunities, transportation systems, and housing conditions (Barker et al, 2010). Because PWA’s are seen as a disgrace, they have a lack of access to healthcare and are low as a socioeconomic status. As a person, affected individuals cannot express their personalities or share their common interests with others because they face to be discrimination anywhere they are seen in public. An example is an individual who faces discrimination stated that, “You can only imagine what happened when I looked at myself as I walked past shop windows, in the rear view mirror; when I looked down, even for a moment, and saw glimpses of white and it didn’t fit with who I was” (Blankenberg, 2000). Within African societies, it is incumbent upon people with albinism to face the consequences of a challenging life because they are considered to be ‘different’ than other members of society. With the difficulty of excluding themselves from anything in society, people with albinism are also faced with the fact that they cannot have the life experiences of feeling a bond or relationship with others among their non-supportive community. The main perpetrators who discriminate people with albinism are family members who are unwilling to share their food and clothes with the affected individuals. Some discriminated people with albinism deal with getting beat to death, spat at, mocked, avoided by peers, and called a harsh name (Cruz-Inigo et al, 2011).

In addition, people with albinism have difficulties getting jobs due to their physical appearance and because they lack the sufficient amount of education or work experience. Also, they have poor visual impairments, which presents them from getting an occupation. Being unemployed leads to not having income. That is one of the main reasons that people with albinism are left to be impoverished and with low socioeconomic statuses. Although, those who manage to succeed in life, end up becoming successful at the occupations they achieved to perform.

Human rights

Discrimination amongst people with albinism has been an emerging topic about human rights, particularly in Africa. While rights are not considered to be a part of the albinism communities due to the different pigmentation in their skin color, African communities have continued to harass and socially discriminate against people with albinism. According to Burke et al, people with albinism are limited to exercise their rights as a human being (Burke et al, 2014). Not expressing the freedom to their human rights limits the ability to enjoy their freedom of expression or speech. In the Constitution of Tanzania, the international conventions on human rights, institutions of Tanzania's Commission for Human Rights, and Good Governance states the purposes of human rights explanations and characteristics (Burke et al, 2014). Within these articles, there are violations for criminals who commit any discrimination against people with albinism. With the help of the government, people with albinism are believed to have equal human rights with others. There are also activists who protest to stop the violations of human rights amongst people with albinism. These activists and supportive members of the community believe that people with albinism are, "...humans who deserve the same rights as others" (Burke et al, 2014). The ability of living and being a human being is the meaning of having the connection and bond with their community in order to share the common interests and cultural beliefs together as a unified whole. With the help, of having a social relationship within the community, PWA's are able to practice the significance of human rights. Burke also mentions that the way people treat each other is in the determination of having rights and it is in the wrongdoing to kill a human being who has no reason to be killed (Burke et al, 2014). This means that there are crimes committed due to people killing people with albinism for their body parts and having a cultural belief that their bodies bring a sacred meaning into fortune and wealth. It is described as, "people with albinism are slaughtered like chickens at the whims of wealth-hungry individuals" (Burke et al, 2014). This is a concern to the PWA communities who believe that their right to be human is in a crisis because their value in life is not appreciated to the majority of the community they are living in. However, some communities still disapprove of having people with albinism to have any part of human right expressions. With the help of the government still in place and rising, there are still issues such as: not doing enough protesting, making any action moves, or supporting victims who do not have a voice. According to Burke, "Rights are 'legitimate claims' involving three intersecting dimensions: social, legal and personal" (Burke et al, 2014). The social aspect provides the meaning of unity as a culture of the same beliefs through

each and every person in the community. The legal rights are focused on the intentions of the international and national laws that human right practices are made without the violation to commit any crime against people with albinism. The personal aspect is the value that people with albinism are understanding the main concept of what human rights means to them and the ability of what they are knowledgeable about. The media being in place to bring up the topic of albinism helps encourage public awareness activities of human rights for people who believe in the 'common humanity' within the community (Burke et al, 2014). Public awareness will contribute to stopping the harmful and violent accusations against people with albinism and stop affecting those who are loved ones that have to deal with the social, cultural, and political discrimination.

Solutions

There are numerous awareness campaigns dedicated to reducing albinism discrimination. These campaigns are organized to assist people with albinism with proper medical care and available resources to treat skin cancer (Cruz-Inigo et al, 2011). There are organizations and agencies that help improve environments for PWA who are feeling discriminated against. For example, the Tanzania Albino Center is an organization to help develop the surroundings of children with albinism within their living conditions and school settings. Another organization by the name of the World Health Organization, helps improve the health issues that are occurring to people with albinism who are unable to afford any sunscreen or other health treatments, such as burning of the skin and vision impairment of the eyes.

Method

I will search online, publicly accessible social media communities, such as Reddit, to recruit participants. I will find three or more individuals who are affected with albinism and live within the country. Once I find three or more individuals, I will email them to ask if they are interested on volunteering for a research project in regards to albinism. If they are, I will send them an informed consent form to sign and return to me in order to start the interview process. I will interview them through Skype, phone call, or in person, depending on the interviewee's availability. The interview will be a semi-structured interview that uses a list of questions prepared for the interviewees. The questionnaire will consist of 18 questions in total. The amount of time should range from 30 minutes to an hour depending on how long their responses are. I will take notes of every question they answer. They are able to skip questions they do not want to answer. The questions will relate to the social aspect of having

albinism. I will also distribute roughly 30 survey questionnaires to students at CSU Stanislaus through the Honors Program and other campus settings. I will find at least two people per major department to get a widespread idea of who is knowledgeable about albinism and the social aspects that can lead to discrimination. After inviting students to participate, I will briefly explain the project, give them the informed consent forms, answer any question they may have, and give them a written copy of the survey to fill out after they have signed the consent form. After they are done with the survey, I will collect it from them. The survey will consist of nine simple questions in total. Some questions will be true or false, some will be yes or no answers, and some will have an explanatory section for students to speak their minds.

Conclusion and future research

With the present study I am conducting, I will have at least three interviews with people who have albinism willing to volunteer in the research to get their experiences out in public. I am also hoping that knowing this is a timely manner study, it will be possible to get all the data needed to support the topic of albinism with the literature review I am doing. My results will show that the people with albinism that I interviewed have faced social discrimination among their society. I also anticipate to bring awareness to the social struggles that people with albinism face in their everyday lives.

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“Sugar dating” among college students in the United States

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Abstract

Sex work is and has been a consistent and ever-growing institution that continues to exist throughout the world today. Although sex work has been around for centuries, more recently a new facet of this industry has emerged: Sugar Dating. Sugar Dating is a phenomenon where individuals who are older and of a higher socioeconomic class engage in relationships with younger individuals who are of a lower socioeconomic class. The difference between these relationships and other intergenerational relationships is that Sugar Dating relationships often involve an exchange of money or gifts from the older and richer partner for the companionship of the younger partner. Research on these relationships has been limited, but the media coverage has been consistent. There has been generally positive coverage of these types of relationships in the media, which has led to a spike in interest by the general population, causing young women to engage in relationships that are said to be based on companionship when, in reality, these relationships are more focused on power, money, and sex. This paper looks at the negative effects of these relationships, including sexual exploitation and violence, and what we can do as a society to help change the narrative about sex work.

Keywords: Sex work, human trafficking, sugar dating, prostitution

Introduction

Sex work is an institution that has been around for centuries and has not only maintained, but grown exponentially over the course of history. It is hard to estimate just how many individuals are in the sex industry because it is so diverse. Some of the major facets include sex-trafficking, prostitution, and the pornography industry. Each of these have different levels of acceptance and stigma attached to them with pornography being the most widely accepted. Prostitution and sex-trafficking, on the other hand, have a negative connotation surrounding them. This often comes from the exploitation factor that surrounds these facets of sex work. Often there are children who become forced into prostitution and sex trafficking. The feelings conveyed by this line of work are understandable. However, in cases of prostitution, and generally selling sex for money, it is sometimes described as being okay if the sex worker is able to freely choose to stay in the profession (Sanders, 2006). Although this is often not seen as acceptable to most of society, there is one type of sex work that has become popularized in the past couple decades: sugar dating.

Recently, there has been a trend in acceptance in commercialization of sex, which has led to an increase in sex as a commodity being mainstreamed in society. Researchers have found evidence to support this increase in societal acceptance (Bretns and Sanders,

2010). This research focused on how sex has become overly commercialized throughout the world and the consequences of this. Bretns and Sanders found evidence to support that changes in social and economic values and structures, there has been an increase in sex work as a result. Young adults, especially college students, are at a greater financial vulnerability due to the increase in college tuition prices as well as the general increase in cost of living. Minimum wage has not increased enough for these individuals to be able to provide for themselves, which causes many college students to have to/consider moving back home. This can often times cause feelings of depression and lowered self-esteem for these adults, which can push them to finding alternatives in sex work.

Sugar dating is posed as a safe and easy alternative to trying to balance school and working one or more part-time jobs. However, sugar dating is not as simple as it may seem on the surface. Although there has not been much research done on the topic, there has been an increasing social awareness of the industry. This social awareness has led to discussions about the reality of sugar dating and the consequences that this industry has on individuals and the greater society.

Sugar dating relationships

Sugar dating is an endeavor that is almost exclusively originated through online means of

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communication. There are many dating type websites and dating applications that promote sugar babies and daddies/mommas to come together to form relationships. The main reason that sugar dating is done online is due to convenience. It is easier to meet a large variety of individuals online as opposed to in person. It takes less time and you can find out a good amount of information about an individual in a concise profile. Also, it is easier to meet people who live in a larger mileage range from an individual's location. Due to the ease of using online applications to achieve sugar dating relationships, there are a variety of online businesses that have popped up that cater to individuals seeking this type of relationship specifically. Other apps, although they don't directly cater to this population of individuals, have seen an increase in use of the services to engage in sugar dating.

There are many websites and services that have popped up to engage this rapidly growing industry and they too must tread lightly in order to avoid legal trouble. However, these types of sights are not the only way that sugar-babies and sugar-daddies/mommies are finding each other. Many individuals are using common dating and hook-up apps in order to find others who want a sugar-dating type relationship. One such app is Tinder. Tinder is a dating app that many individuals use to meet potential individuals to have some type of relationship with. Some individuals use the app for dating, casual sex, or even friendship. Individuals make a profile and can set preferences for gender and location range in miles from their current destination. From there, app users are able to see other users in their area and can choose to "like" or "not like" them. If two users both "like" each other, they will match and can proceed to have a conversation with the other and let the relationship, whatever that may be, develop from there. Tinder, as an app, does not facilitate the types of relationships users engage in, so there is no risk to the company if their customers use their app to trade sexual intercourse for material gain. Due to this, Tinder has become a popular way for individuals to engage in sugar-dating relationships.

Other than Tinder, or other general social media platforms like Facebook or Instagram, there are many specific websites and mobile applications that are geared toward sugar dating specifically. For android and ios (Apple) mobile devices, there are apps such as SugarDaddyMeet and SugaDady which work to match potential sugar babies with sugar daddies. There are also applications that match up with sugar dating websites like SeekingArrangement (Best Sugar Daddy Apps for iPhone & Android, 2018). SeekingArrangement is one of the most popular sugar dating websites currently around, with millions of members worldwide (*About us*, 2018).

Demographics

Most sugar daddies and mommas are older individuals who are high middle class to upper class. Outside of these commonalities, there is not a lot that sugar daddies and mommas have in common. Sugar babies can be both male and female and may have a sugar daddy or momma no matter the sugar baby's gender. However, most often couplings are female sugar babies and sugar daddies. This is due to a higher demand from sugar daddies for young, attractive female sugar babies. There are not as many older females looking for younger males to have this type of relationship with. This can be seen on one of the leading online meeting sites for sugar babies and daddies/mommas: SeekingArrangement. SeekingArrangement boasts about having 10 million active members, with most of their population being sugar daddies and young women (*About Us*, 2017).

SeekingArrangement actively caters to these sugar daddies who are looking for young women to have relationships with. They have a number of advertisements, both online and physical, aimed at specifically young, attractive women. Example of physical advertisements are mainly seen with billboards in major cities like Los Angeles, New York City, and Chicago. Some of these billboards have saying such as "Happy 18th Birthday! Meet Your New Daddy" and "Don't get screwed by Obama care. Find a sugar daddy". Along with billboards, SeekingArrangement also has ads throughout the internet, including Google advertisements. If you google "sugar daddy" or a variation of such, about half of the results are simply advertisements for SeekingArrangement and other websites like it, not even just links to their page, but paid for advertisements from said websites. SeekingArrangement conducts video ad campaigns illustrating their services, as well. One of these commercials is very obviously targeting young, attractive women with their headline "Sugar Baby University: Say goodbye to college debt and hello to a higher class education," (*Sugar Baby University*, 2018). All of these advertisements are clearly geared toward recruiting young, attractive women to be employees of their services. SeekingArrangement goes as far as offering incentives to college students for joining their site. If an sugar baby joins SeekingArrangement using a .edu email, they will have access to a premium account for free, as opposed to paying upwards of \$1000/month that a premium account would cost normally (Kitchener, 2014).

In terms of the sugar daddies using the website, there is no outward advertisements geared toward them. This makes sense seeing as the wealthy men are the ones actively trying to find younger women and are willing to pay quite a bit of money to do so. However, there is

an incentive sugar daddies can take advantage of through SeekingArrangement. SeekingArrangement allows sugar daddies to promote the website's services on the sugar daddies' own websites (or personally) for a commission. For every sugar daddy that brings in other sugar daddies, the original sugar daddy will make commission off of all the money that the other sugar daddies pay to/through the site (*Affiliate*, 2018). This, and word of mouth, are really the only way that SeekingArrangement gains their consumers. However, it seems to work as the site is obviously profitable and successful.

Gender differences

Although sugar dating has become a common cultural phenomenon over the past decade, there has been very little research done on the topic. However, there are common patterns that can be seen through individuals' experiences with sugar dating. Sugar daddies and their female sugar babies engage in relationships much differently than sugar mommas and their male sugar babies. The biggest difference between these pairings is in regards to sex. Sugar daddy/female baby relationships tend to focus more on sex as a priority, while sugar momma/male baby relationships tend to be more about developing a nurturing relationship with sex as a possible occurrence down the road as a part of the relationship. A former female sugar baby stated that in her relationships with sugar daddies that technically "sex was never a requirement on Seeking Arrangement, though I found it was often the main aspiration for these men" (Anonymous, 2017). In another article, three male sugar babies shared their experiences with their sugar mommas. Each of the men agreed that "sex was never forced or expected in the beginning" and that "gifts were never in exchange for sex" (Hsieh, 2018). Women explain that there relationships with men often focus on sexual appeal and sexual activity. A good example of this is women often engage with men over long periods of time. One female sugar baby met with a man once and was paid \$500 for a small dinner and a few hours spent in a hotel room with a jacuzzi and champagne (Anonymous, 2017). Men describe their interactions with their sugar mommas as being more like a regular relationship, where their partner just happens to be quite a bit older and of a higher socioeconomic status. In an interview about their sugar dating relationships, three men commented that the financial status of their sugar mommas had no bearing on their relationships. The three men stated that they would have engaged in a relationship with the same women given the opportunity even outside of a sugar momma/sugar baby type relationship. These men also had monogamous relationships with their partners and the relationships

only ended due to changes in life circumstances rather than over money or a similar issue (Hsieh, 2018). Overall, it is evident that female sugar babies are more likely to engage in relationships that resemble sex work, while male sugar babies are more likely to engage in relationships that are based on mutual respect and compassion.

Consequences of sugar dating

Sugar dating is not a simple entity that is limited to effects within individual relationships. These relationships also affect society as a whole. These consequences are necessary and important to understand how sugar dating may benefit sex workers and make these types of relationships safer, and at the same time possibly be encouraging misogynistic views in society.

Positive aspects

Although sugar dating can be seen as a form of sex work, sugar dating has an advantage over other sex work platforms. Like sugar dating, other sex workers have transitioned to digital. The internet has become an easy way for sex workers to help themselves stay safe while working. It is known that sex work is a risky career for many reasons. By using the internet to their advantage, sex workers are able to find clients online and be able to do background searches and find other information before they ever meet their client in person, which allows the sex workers to stay safer while doing their jobs. Also, sex workers who work online can often avoid pimps who would exploit them and cause them pain. Being online allows sex workers to work from home and remain somewhat anonymous to other people in their life. Sugar dating is one way that sex workers are able to take advantage of the online sex industry.

Negative aspects

Sugar dating has become not only a common practice in society, but an accepted and encouraged one. The media has helped mainstream these relationships by showing only the positive aspects of these interactions. As shown above, sugar dating has also allowed many sex workers a safety net by being able to check out clients online before meeting them in person. However, many of the women who make accounts on sites like SeekingArrangement are not experienced sex workers and/or do not make an account under the assumption that sexual activity is expected. SeekingArrangement as a site does not technically promote sex for money, but most sugar daddies on the site expect sex from their sugar babies.

Researchers found that there were many sugar babies who after engaging in a few "dates" through SeekingArrangement that they felt uncomfortable and

ended up getting rid of their profile (Bien-Aime, 2017). These stories about women who feel exploited or coerced into sex from the sugar daddies that they meet on sugar dating sites are not the stories that get popularized in the media. The more popular stories are those that show the benefits of sugar dating and how college women have been able to pay for their tuition without having to get a job while in school (Wexler, 2017). Due to this absence of bad press on the realities of sugar dating, there continues to be a flood of young women seeking these types of relationships with older men, without being aware of what these men will ask of them. Due to this, many women are vulnerable to be taken advantage of due to their naivety. This is in no way the victim's fault, and society should be more open to sharing stories about what can go wrong and how to help sex workers engage with clients more safely. However, this is not the reality and instead sex workers are often blamed, or not believed, about the abuse that they may suffer at the hands of their clients. In 2013, a young woman in her mid-twenties was raped by an older man she met through SeekingArrangement. During their second "date," he pinned her down and forced her to have sex with him. The woman went to the hospital after she left and had a rape-kit done and filed a report with the police (Chung, 2017). Even though this woman did everything that society claims a rape victim is supposed to do (i.e. report immediately and keep your story straight), she was still blamed for her attack because she was a sex worker. The case was dropped by police because they deemed there wasn't enough evidence to convict her wealthy-high status, rapist. Worse, the press stated that the woman was only "crying rape" in order to try and get money from her attacker (Jacobs, 2013). This stereotype about women crying rape in order to get money is sadly a common way for society, especially the media, to claim that rate of false rape accusations is high when it really isn't. This, accompanied with the high rates of victim blaming and the high socioeconomic status of sugar-baby clients gives little room for victims of sexual violence at the hands of these men to speak up and share their stories.

The reality is that sugar dating is very similar to prostitution, but there are no legislation to help monitor this part of the sex industry. There are no protections to help sugar-babies who may become victim to sexual violence at the hands of their sugar daddies. This leaves sex workers open to predators who are looking to add to their sex trafficking or prostitution ring. Having this type of business conducted online is a good way to help weed out predators, but there is only so much a person can do to try and protect themselves, when they really shouldn't have to. Sex workers deserve just as much trust and compassion as any other individual, but sadly sex workers are believed and blamed for their victimization even more so by society than the general

population. This only causes more stigmatization and less reporting, and in turn no legislation to help protect this population of individuals.

Discussion

Sugar dating, and all it encompasses, has drawn attention from psychologists and sociologists who wonder just how close sugar dating is to prostitution and other forms of sex work. Although there are similarities, mainly that of sexual favors in exchange for monetary gifts, this is not the main issue to be discussed. Research does not need to show how sugar dating is similar to prostitution. Instead, research should be wielded to help support sex workers themselves and make it a safer industry.

Future research needs to be done on this topic. The information here is simplified and general in regards to sugar dating. Research should be done to understand further the consequences, both good and bad, that sugar dating has on society. This research is necessary in order to protect sex workers who engage in sugar dating as a part of their career, as well as to protect individuals who go into sugar dating inexperienced and at risk for exploitation. Also, further research on gender differences in sugar dating should be done to understand how the patriarchy and misogynistic tendencies affect how women view themselves as sex objects and why this may lead them into sex work, as opposed to another career.

Overall, sugar dating is just one facet of a large sex work industry. Sex work has jobs worldwide, and sugar dating is a career that comes with a higher salary than a lot of other common jobs. The promise of paid tuition, health insurance, and other expenses has drawn in millions of individuals to sugar dating. Research on this phenomenon is important so that society can understand the effects and what changes should be made to help sex workers if need be, but researchers have the duty to help de-stigmatize sex work as well

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The importance of invisible people and places in the American West: An archaeological case study in the San Luis Valley, Colorado

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Abstract

The American West has been the focus of the national imagination since the majority of the land was gained after the wars with Mexico in the 19th century. The region since has also been the subject of more current academic research within the field of historical archaeology. This paper presents the context and discussion of the interaction between the western military and the civilians who lived alongside, worked for, and interacted with them through the lens of historical archaeology, with a specific emphasis on the working women who served the U. S. Army as laundresses. Archaeological investigations in Fort Massachusetts, the 19th century army post in the San Luis Valley of Colorado, will serve as the main case study on how historical and archaeological detective work can illuminate the roles and experiences of civilians at frontier forts. Along with a brief sketch of the history of the military interactions in the New Mexico territory and Fort Massachusetts, I will report on the archaeological work done thus far on the post site. The material culture encountered in recent excavations of Fort Massachusetts reveals not just the work activities of the laundresses, but also more intimate details of their frontier experience. A broader goal of this study is to show the part archaeology has in providing a more complete and inclusive picture of the American West.

Keywords: Historical archaeology, U. S. Military, frontier, fort, Colorado, civilians, Fort Massachusetts, American West, Army, New Mexico, 19th century, army laundresses, sutler

Introduction

The end of the Mexican-American War, marked by the Treaty of Guadalupe Hidalgo, brought on a pivotal period in American history. The treaty, signed in 1848, ceded the vast northern Mexican territory to the United States. The acquisition of the stretch of land accelerated the westward expansion to the Pacific. Contrary to popular belief, the U. S. did not gain empty land. A parcel of the cession was the New Mexico territory, now divided up and known as the states of Arizona, New Mexico and southern Colorado and Nevada. The area was and still is the home of diverse groups of people with deep and colorful histories in the region. Numerous Native American groups, traders, Hispanic settlers, and fur trappers lived in the Southwest long before the Mexican-American War. From the outset of the war, the U. S. military sent enlisted men to gain and maintain American presence and dominance in the new territories. Once the U. S. integrated the new territory into the Union, the government took on responsibilities to the people who already lived there. Frontier forts and garrisons were meant to protect settlers and traders from hostile Native American groups. Unlike previous governments, first Spanish and then Mexican, that did not get involved in conflicts between settlers and

indigenous groups, the American military immediately promised from the onset of their occupation to do so. While the history between the U. S. military and Native Americans in the West is complicated, the military acted as intermediaries for settlers and the tribes through policy, treaties, and fort installations (Sides 2006, Oliva 1993).

Clearly these military installations are crucial to the history and development of the American West. Yet, when we think about these military forts that are crucial to the westward expansion of the U. S. we tend to picture only the soldiers and the officers. We forget or have no idea of the presence of those who are important to the running of the fort and are part of the history of the western frontier. This is not just the fault of the public. For example, while numerous resources exist on soldiers, from their experiences to their uniforms, literature on army washerwomen, as I will explore in more detail later in the article, is scarce (Lawrence 2016). Frontier military forts were magnets for a wide array of people. Some followed the soldiers from home to their new posts in the West, others from as far away as Europe found themselves there because they were attracted to the opportunity enlistment or employment could bring, and others passed through as travelers seeking protection or brief haven. Western forts drew in

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members of the surrounding local communities as well (Sides 2006, Wooster 2005).

The civilians who worked in these frontier installations are the focus of my research. It is the purpose of this article to discuss and contextualize the interaction between the western military and the civilians who lived alongside, worked for, and interacted with them through the frame of historical archaeology. The focus of this study is on the mid-19th century, starting in 1848. Fort Massachusetts, Colorado's first American military post, will serve as a case study of how historical archaeology can illuminate the experiences of civilians in a remote frontier post. Thanks to the work of archaeologists and historians, Fort Massachusetts has proven to be no different from the new posts in the West.

It can be argued that we have these incomplete ideas about not only what the American West is, but also about who were the people who lived and shaped its history and development. We know one side of the history, but not the other. The goal of this article is to help fill in these gaps in what we think of Western history. With the information gathered from historical and archaeological sources, academics and the public can get a fuller picture of the lives and experiences of the men and women on the western frontier. Fort Massachusetts, being one of the first extensions of the U. S. in the New Mexico territory and as the subject of both types of research, is a good case study to launch into the discussion of how both types of research can help us better understand this fascinating part of American history and those who shaped it. I will begin this study with a brief introduction to historical archaeology. Then we will delve into the meaning of the American West and sketch its history looking in particular at U. S. military involvement and relationship with the region. From there the focus of this paper will turn to Fort Massachusetts and the San Luis Valley in the mid-19th century. While I will present an overview of the civilians working with the posts, the focus on the rest of this study is on an often over-looked group present in this point in time and place: women, specifically, working women serving the U. S. Army as laundresses.

Historical archaeology

For the purposes of this article I will use Orser's definition of historical archaeology as "a multidisciplinary field that shares a special relationship with the formal disciplines of anthropology and history, focuses its attention on the post Columbian past, and seeks to understand the global nature of modern life" (2017). To understand how historical archaeology stands out as a subdiscipline within archaeology, one must know exactly what past cultures and time periods

are addressed in this field. Traditionally the human past is categorized simply as history and pre-history. Orser's division is much more helpful to understand the research of historical archaeologists. Past cultures can be divided into three categories: oral cultures, textual cultures of antiquity, and textual cultures of the modern era. Historical archaeologists focus on the latter. They study the people who built our modern, a time period that spans from 1415 AD to more recent history within living people's lifetime. Archaeologists who work with remains of literate cultures of the ancient past are not considered historical archaeologists, but rather they conduct text aided archaeology. As terms, "pre-history" and "history" inadequately represent the past. Oral based cultures, those that rely on the spoken word and are non-literate, can overlap with literate societies through contact (Orser 2017).

The historical archaeology approach combines methods from archaeology, anthropology, and history, including oral history and ethnohistory. The field is embedded in anthropology, so practitioners are concerned with anthropological questions. Themes of historical archaeology cover multiculturalism; gender roles; ethnicity; social inequality; contact, and settlement and the effects of these on indigenous populations. The connections between past and present are stronger and these issues remain relevant (Orser 2017). Relating specifically to archaeology of the American West, Dixon presents four major themes of study: migration and diaspora, colonialism and post colonialism, landscape transformation, and industrial capitalism (2014)

Historical archaeologists work with documentary sources and the material remains of the past. Historical records are invaluable resources, but we must remember they are products of people and as a result have opinions judgements, perspectives, and the stands of their authors. The objects archaeologists excavate do not tell us anything directly and do not offer a point of view. It is up to the archaeologist to recover material culture, gather data, make observations, and offer interpretations to explain the objects (Renfrew and Bahn 2012). Because they work with two different types of data, historical archaeologists must critically evaluate all evidence, whether archaeological or documentary, and do not assume one is more correct or reliable beforehand (Church 2002).

The goals of historical archaeologists are similar to those of any archaeologist. They seek to provide information useful for historic preservation and site interpretation. Historical archaeologists learn about past lifeways, especially of groups who are underrepresented in historical records, as well as aspects of daily life that often go undocumented and overlooked by historians (Orser 2017). In this way, according to Deetz, historical archaeologists do history "from the bottom up" to

reconstruct the lives of the people who participated in events and phenomena that shaped our present (Deetz 1996, Goddard 2011).

What is the American West?

I will use Dixon's definition of the American West as the area west of the 98th meridian in North America. It includes the stretch of land encompassing the Great Basin, the Great Plains, the Pacific Northwest, the Pacific Coast, the Rocky Mountains, the Southwest deserts, Alaska, and Hawaii. The West can be a tricky geographic area to define because the U. S. acquired territories through a good portion of its history so the frontier, or the West, evolved with each territorial expansion (2014). Since the definition for the West is so broad, I will focus on what would be the western frontier in 19th century. This is the new lands in the continental U. S. from the Mexican Cession of 1848, but more specifically, the New Mexico territory. New Mexico included the land on which Fort Massachusetts would be built.

The American West is not only a geographical location, it is much more complex and rooted in the people who lived and traveled through the land, who ultimately shaped American history. The American West is historical process of expansionist ambitions, contact of various groups native and foreign, and of settlement and integration. It is also an idea and a narrative held close to the identity of the American people (Dixon 2014, Church 2017). The stories of the West were created while its history was unfolding. The narrative continues to this day in the popular imagination perpetuated through Westerns, novels, textbooks, tours of sites, and signs marking the sites. We cannot seem to help telling and retelling the stories. The West is iconic and embedded in the national conscience. Not only do we love the "Old West", we hold the ideals it represents as deeply American. Often, the West we conjure in our minds is one-dimensional, because certain perspectives and ideas of history are emphasized over others. Church highlights the problem with her study on the Santa Fe Trail. The popular history of the trail suffers from ethnocentrism. The trail is a historically significant trade route, but the accounts tend to emphasize the Anglo- American perspective and ignore the Mexican context even when the Mexican government opened the cross-border trade and the majority of trade goods from the U. S. went to Mexico. History as told in the U. S. about the trade remains silent on the Mexican side (Church 2017).

Historical context

As Oliva observed about the relationship with local populations of the New Mexico territory in *Fort Union and the Frontier Army in the Southwest*, "The military,

an agency of the Anglo-American penetration of New Mexico, was only one of several parties in the complex and fragile structure of the ethnic intercourse in the region" (1993: Chapter 3). Pre-Civil War army in the West focused on Native Americans and their interaction with settlers and travelers. The purpose of military presence was to keep the peace and to respond, through war and treaties, to native threats. Fort garrisons prevented attacks and raids through means such as escorts, patrols, reconnaissance and exploratory missions. When these attacks occurred, the role of the army changed once an Indian group was identified as hostile or assumed hostile parties. The forts would launch campaigns to pursue and punish the guilty bands (Oliva 1993).



Figure 1: Fort Massachusetts sketch by RH Kern from the Pacific Railroad Survey led by Captain John Gunnison. Expedition stopped at Fort Massachusetts to San Francisco in August 23, 1853 to rest and resupply on their journey (Allen, et al. "2. Fort Massachusetts)

Despite American military presence, conflicts with native populations continued in the West. One of the main problems was that the U. S. government never developed efficient and consistent policy for Native Americans. The main, and separate, agencies at the forefront of applying policy and acting as an intermediary between the U. S. and the native populations were the Bureau of Indian Affairs and the War Department as of 1849 (Wooster 2005). The authority of the Bureau and the War Department was unclear and lines where they each knew their role in native relations blurred. As a result, both agencies often did not cooperate with each other and left native peoples unsure of where they stood. Another factor that complicated native and non-native relationships was broken treaties and promises that pushed native people to raid to survive. Native tribes suffered from settlers going into their traditional lands and having resources like hunting game depleted. Sometimes their options were to starve or raid. Agreements by local governments to provide aid and support for native populations an attempt to keep peace in the area were not approved or

went unfunded by the federal government. Indian Agent John Greiner, who was still an agent by the time Fort Massachusetts was built, attempted the peacekeeping approach and sought to make agreements with several New Mexico tribes in the 1850's. The treaties that would have fed and settled the tribes were ultimately rejected and Greiner could not secure the funds. The tribes, among them the Jicarilla Apache and Ute in 1854 to 1855, took to raiding to survive and retaliate (Oliva 1993).

The military established Fort Massachusetts, the first U. S. military installation in Colorado, in 1852 just four years after the acquisition of the New Mexico territory. In March 1852, authorization was given from the military headquarters in Albuquerque for a new post in Ute Indian country near the Rio Grande. Lieutenant Colonel Edwin V. Sumner, who gave the orders for its construction, likely named the fort after his home state. Major George Blake, First Dragoons, became the first commandant of the post and chose its ill-fated location. Major Blake and his two companies set out to build the compound and the fort was reported as established on June 22, 1852 (Taylor, 1968). The fort site is nestled at the base of the Sangre de Cristo Mountain Range between two branches of the Ute Creek, in the San Luis Valley of southern Colorado. At the time, the fort was located on the Taos Trail, a major trade route between New Mexico and Colorado. Small and dispersed Hispanic agricultural settlements dotted the Valley in before and during fort times. Native American groups, mainly Utes, Navajo, and Jicarilla Apache, lived in the San Luis Valley (Goddard 2016). The closest contemporary settlement to Fort Massachusetts was an agricultural Hispanic settlement on the Culebra River, about thirty miles south (Crimmins 1937)

The architecture and layout of the Fort was not well recorded while it was standing and active; however, we have snippets of information in the form of contemporary brief descriptions and sketches. Starting 1853, Col. Joseph Mansfield, appointed Inspector General for the U. S. Army conducted inspections of the War Departments in the western territories. Mansfield began with the New Mexico department and inspected the newly constructed Fort Massachusetts. He drew up the only known contemporary sketch map (Figure 2) of the post which depicts the main compound as well as associated structures and the creek branches on both sides. Mansfield's map identifies the planned layout: the quarters for officers, soldiers, and laundresses, guard room, hospital, kitchen, bakery, smith shop, block house, corral, and sutler store (Crimmins 1937, Figure 2). It is important to note that the map does not include dimensions or a scale which makes it difficult to translate it directly onto the remains of the fort. The historical record also tells us the eastern influence on the construction of the main compound. The fort stockade

is built of logs, stood ten feet high, and had quarters to accommodate one hundred and fifty men (Taylor 1968).

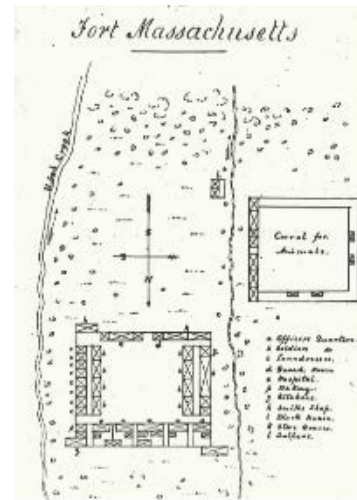


Figure 2: Col. Mansfield's 1853 map of Fort Massachusetts (North points to bottom; Goddard 2011)

Only one military engagement occurred in the fort's history against Jicarilla Apache and Ute raiding band in 1855. During the winter of 1854 and 1855, the Ute and Jicarilla Apache began raiding. One of the attacks occurred on December 25, 1854 when a band of Apache and Ute raided Fort Pueblo, a non-military traders post. The settlement is located on the Arkansas River north of Fort Massachusetts (Taylor 1965). The attackers made off with two hundred head of livestock and three captives. They killed fourteen in total. In the campaign against native bands, Fort Massachusetts played a role in the pursuit of the Ute and Apache raiding parties. The commander of the fort at the time, Captain Horace Brooks, was informed of the plans to organize a campaign and instructed to use troops to gather information on the whereabouts of Ute and Apache in January. Troops, volunteers, guides, and Indian Agent to Taos Christopher "Kit" Carson assembled at Fort Massachusetts (Oliva 1993). The New Mexico Volunteers, mounted volunteers, participated in the campaign. (Taylor 1965). The forces left the post on March 14, 1855. Their mission was to find and punish the raiding bands led by the Ute Chief Blanco and Apache Chief Huero. The men pursued the bands and engaged them briefly about 100 miles north of Fort Massachusetts, but they managed to escape. In April the forces ambushed a Ute camp, but Chief Blanco escaped. Pursuit and attacks of native parties continued until later in the summer, when the Jicarilla and Ute tired of being on the run and were ready to make an agreement. Governor David Meriwether met with delegations of Ute and Jicarilla and signed peace treaties with both tribes on September 11 and 12, 1855. In exchange for ceasing raids and giving up claims to their

lands, the tribes would get protected reservations, blankets, clothing, household items, and farming supplies including seeds. The Senate would go on to reject the treaties (Oliva 1993). First Sergeant Rafael Chacon, one of the Hispanic Volunteers, and the personal letters of DeWitt Peters, the assistant surgeon stationed at Fort Massachusetts, are the major source for information about the campaign (Taylor 1965).

The location of Fort Massachusetts, although beautiful and scenic, caused problems for the garrison which historical accounts support. The harsh winters forced the garrison to move to Fort Union until Spring (Taylor 1968). Mansfield did not give a detailed description of the fort in his report, but he did criticize the poor defensive position of the fort and pointed out that it did not intersect with a major Ute route in the Valley (Crimmins 1937; Baker 1965). In Mansfield's report he recognizes the lack of local resources and the fact that Fort Massachusetts had to draw resources from settlements in the Taos Valley and from Fort Union (Crimmins 1937).

Fort Massachusetts was abandoned in June 1858 and the garrison moved to a new post built 6 miles south, Fort Garland. The location of the fort was a factor to its abandonment. While its location was convenient because of the temperate climate, water sources, and abundant game; the fort was too isolated and in a poor defensive position. However, the fort was still in use as an outpost and for civilian purposes after 1858. The archaeological and historical record confirm post-1858 use (Taylor 1968, Baker 1965, Goddard 2011). In the 20th century, a fire leveled Fort Massachusetts. Its successor, Fort Garland was in use for twenty-five years. Unlike its predecessor, six of the original buildings of the are still standing and is now the Fort Garland Museum. Fort Massachusetts was the subject of archaeological investigation in the 1960's and more recently in 2011. Part of the later fort site was excavated from 2003 to 2008 (Wallen Senna 2014, Weiss 2011, Figure 3).

Archaeology at Fort Massachusetts

Past Work

Although the general area of the fort was known to locals, its precise location was lost after its abandonment. Archaeologist Galen Baker from Trinity Junior College discovered the exact location of the fort site, completely buried since, in 1964. He began excavations that same year working in association with the State Historical Society of Colorado. The goal of the initial excavation was to uncover the four corners of the fort and determine its dimensions. Baker used a contemporary sketch map of the fort layout and photographs of the site from the 1900's. The excavations revealed sections of the wall structures of

the main fort, the stockade surrounding it, adjacent buildings, and the corral. Baker was able to observe the adobe bricks and log wall foundation. He found structural wood well preserved and almost whole. He worked out the layout for portions of the main structure and identified the officer's quarters, barracks, blacksmith shop, the southern gate, and the guardroom. Reddish earth, fragments of glass, earthenware, and metal also pointed to past occupation. The excavation produced large quantities of artifacts such as nails, pipes, earthenware, worked bone, and a variety of metal objects (Baker 1965). Unfortunately, Baker died shortly after and his records have not been found. What is known of his work comes from two articles published in *The Colorado Magazine*. Baker's practices are still visible on the site, such as back dirt mounds and mapping nails from his excavations.

Current work

Current excavations began in 2011 under Dr. Richard Goddard from Adams State University, Colorado. The objectives of the project are to identify the exact location and layout of Fort Massachusetts, describe the construction techniques, expand knowledge about the organization of the U. S. Army in the 19th century, describe and explain lifestyles at a frontier installation, explain relationships with local communities and the fort's impact on local history, and reconstruct the past environment and the forts impact on it. However, Baker's excavations resulted in loss of archaeological data and artifacts. The crew has the published articles to know what areas his work affected, but their work uncovers exactly where Baker excavated because he left nails and piles of back dirt on the site. The barracks, laundresses' quarters, corral, a kitchen, the officers' quarters, sutler's building, and parade ground have been identified and partially excavated (Goddard 2011, 2012, 2013, 2016).

Civilian employment on forts

Despite their mission in the West, a fort garrison spent a good chunk of their time invested in the maintenance and running of the fort. An enlisted man spent more time devoted to the duties pertaining to the upkeep of the post than in field service. The fort structure had to be built and maintained. The fort had to obtain supplies and then distribute to the garrison. The fort had to provide rations for the garrison and feed animals it kept, like horses. Providing healthcare was also important (Oliva 1993). Basic duties like cooking, washing and mending clothes had to get done. When rations and issued supplies were not enough to meet the needs or comfort of the garrison, someone had to provide these. Many of these duties fell on the soldiers and officers, but not all. While enlisted men performed

many of the duties to maintain military posts, some occupations were filled by non-enlisted civilians. One of the positions is that of the army laundress, one of the few forms of employment a woman could find in a military post in the 19th century. There is documentary and physical evidence of the presence of the laundresses at Fort Massachusetts. Another is the post sutler, or merchant, who kept goods to sell to the garrison and locals. The identity of the sutler at Fort Massachusetts is known and the remains of his store have been the subject of recent archaeological investigation.

The presence of civilian labor in the forts of the San Luis Valley can be observed in the construction techniques of the successor of Fort Massachusetts. As far as the sources indicate, the first fort was built by the companies. Fort Massachusetts was built with strong resemblance to American forts in the eastern U. S. It is primarily made of logs, with a picket construction making up elements of the structure, and rockwork fireplaces. Forts from the East generally have rectangular layout with a central parade ground bounded by the barracks and other facilities. The whole fort would be surrounded by a wall and have four bastions on the corners. This is also seen in the map and in the unearthed structure, but with some variations on the bastion construction (Goddard 2011, 2016). In contrast, Fort Garland is an adobe fort, built using construction techniques and materials common in the area and that the laborers would have been familiar with. The army employed local Hispanic builders to work with military engineers to erect Fort Garland (Weiss 2011).



Figure 3: Fort Garland Museum, CO (Photo by author)

The U. S. Army allowed civilians to serve as a post's sutler. Sutors supplied the enlisted men with goods not provided by the army. The post merchants are regulated through a board of officers and payed a monthly tax (Wooster). They could set up stores outside the fort compound and were in charge of the upkeep, but the store was still fort property. The sutler had the freedom to sell anything he wished, except he could not sell strong alcoholic drinks to enlisted men. The army forbade the strong beverages and if caught selling to

soldiers, the sutler could lose his license ("Post Sutler-Historical Background"). In the frontier, sutler stores were usually the only one of its kind in the area and would attract local customers (Goddard 2013). John M. Francisco was the sutler for Fort Massachusetts licensed to trade with local Native American groups for six months at the beginning of the fort. After its decommission, Francisco went on to be the sutler for Fort Garland and later to establish his own trading post east of Sangre de Cristo Mountains in La Veta (Taylor 1968). The Mansfield map shows the store located southwest of the main compound. It is depicted as a roofed, two room structure and an adjacent unroofed enclosure. This enclosure may have been a livestock pen. Artifacts encountered thus far associated with the sutler are ceramics, colored bottle glass, and fragments of two ceramic smoking pipes (Goddard 2013). These objects correlate with the role of the sutler and that his store would have a variety of goods in it. Sutors could sell a wide range of items such as processed and fresh food, kitchen and table ware, personal grooming items, horse gear, guns, knives, washboards, manufactured clothing, supplies to make or mend clothing like needles and buttons, and tobacco to keep the list brief. Also found are lithic flakes and two small projectile points. Whether this points to evidence of a prehistoric camp, occupation after the fort was abandoned, or for contemporary native trade with sutler is unclear as of yet. A rock feature and the remains of a wooden plank floor are likely the remnants of the store (Goddard 2013, 2016).

Army laundresses

One civilian group regularly employed in 19th century military forts are army laundresses. The U. S. military usually hired four laundresses for every company. Laundresses do not fit the conventions of Victorian women because they are working class women. The army hired women to wash and mend the clothing of the soldiers, but they also cooked and cleaned for officers and their families, along with other duties. Oftentimes, they are the wives of enlisted men, who would only be allowed to follow their husbands to their post if they also worked there (Goddard 2013). Single women were also employed as laundresses. The government paid and formally recognized laundresses from 1802 to 1876. In addition to their pay, the women received rations and housing. Typically, the women earned more than the average soldier. After 1876, the position was gradually phased out (Lawrence 2016).

Because of their status as working class, military laundresses are an underrepresented group in history. A small part of what historians know about laundresses rarely comes from the women themselves because they were often illiterate. Instead, the primary sources on laundresses come to us mostly from the accounts of officers and their wives that mention the women

(Goddard 2013, Lawrence 2016). Although laundresses were some of the first white and black women to go into remote areas of the American West, few scholarly reports on frontier post laundresses exist. Varying views of the washerwomen existed in their time. One common characterization of army laundresses pictured them as rough, independent, and in the habit of drinking and smoking. Within the military they could be seen as a good influence on the garrison and on their enlisted husbands in particular. They are crucial to the running of an army post, not just because they wash clothes but because they performed other jobs needed. Laundresses are devoted workers and members of their garrison who acted as nurses, companions for the men, and child caregivers. They were thought of as ladies who provided a feminine presence to their posts. Others in the army ranks did not agree with these opinions and thought of the women as an unnecessary expense (Lawrence 2016).

In Fort Massachusetts, the Mansfield Map illustrates eight quarters for the laundresses along the east wall, within the compound structure. This is not a common living arrangement, especially in the frontier, for the washerwomen. It was an exception, rather than a rule in military practice. Housing is one of the benefits provided for laundresses; however, the quality and type of housing arrangements varied from post to post. Often housing was inadequate and at times it was unlivable. Tents, makeshift hovels, houses, and rooms in the fort structure could serve as the "laundress quarters". In Austin, Texas, in the 1870's the laundresses lived with their families in tents. A barn housed laundresses in Fort Laramie, Wyoming. On the other hand, at Fort Keogh, Montana, laundresses lived in log houses with a backyard. Women stationed in two posts in Arizona and Yuma, California, were housed in adobe huts. In the case of Fort Massachusetts and Fort Union, laundresses resided in rooms in the same building as the company quarters (Lawrence 2016).

The material remains of the laundress's quarters in Fort Garland are the subject of an archeological investigation on the female identity in relation to Victorian gender values linked to post laundresses. Weiss investigates how the women used material culture to create and express their gender identity as well as to see to what extent the women maintain Eastern Victorian female ideals in the frontier. His observations show even though the women worked and lived far from the eastern U. S. "working women did not submit to functionality, but rather embraced the socially constructed gender ideology and responded to it by accentuating their femininity and class aspirations" (Weiss 2011: 13). At the time there were strong beliefs as to how a woman acted, what she values, the sphere where she belonged (domestic), and how she presented herself. Victorian women in Europe and the eastern U. S. practiced these gender conventions and that

translated to their material culture. Weiss argues we can see the maintenance of Victorian female conventions in the laundress's material assemblages relating to women's clothing and personal adornment and ceramic ware. For example, remnants of hoop skirt stays and corset stays indicate the working woman who chose to wear the items, as opposed to more practical choices better suited for work, did so as a symbol of their femininity. The presence of expensive porcelain (19.35% of the ceramic assemblage recovered in 2007) and tea ware, likely represents similar desires to continue living as close to a proper Victorian lifestyle as they could get.

Excavations in 2011 uncovered a laundress activity area just outside the compound walls. Among the artifacts found are a silver ring; a comb fragment; a table-knife blade; and about half a dozen, fragmented, clay smoking pipes. Most of these were found outside the east side of the outer wall (Goddard 2011). A study focusing on the from the 2011 to 2013 seasons observed of the 533 glass fragments counted in the women's quarters, over half came from these outdoor work spaces (Wallen- Sena 2014). An explanation for the assemblage is that the with a low chance of attack on the fort, the women were able to work outside the protective walls. This would have suited them well, as the east side of the compound was close to a creek. The women likely would have taken advantage of fair weather to wash outside (Goddard 2011). Two work spaces identified from the three seasons identified two specific outdoor work spaces along the east wall. One toward the center of the east wall and another near the southeast entrance (Wallen-Sena 2014). More likely, evidence relating to the women's work came in the form as series of post holes in that area. The post holes, a hole dug in the ground to hold a post upright, could have been imprints of a wind-break, drying rack, pot or tub support for clothes (Goddard 2011).

Material culture found within and as part of the laundress quarters have the potential to illuminate more of the women's everyday activities. One type of artifacts unearthed at Fort Massachusetts are smoking pipes. A minimum of three tobacco pipes found in quarters during the 2011 to 2013 field seasons. The pipes are made of unglazed white clay with simple embossed decorative designs in the women's quarters. The pipe fragments do not exhibit a maker's mark, a unique marking distinguishing the manufacturer (Wallen-Sena 2014). One of the pipe fragments found within the compound indicates it was part of an opium pipe. Opium was a popular recreational drug and medicine for various ailments during the Victorian Era (Goddard 2011). Taking a different form of escape from the monotony, loneliness, and the hard work of being a laundress in a remote outpost, the glass assemblages of Fort Garland suggest pervasiveness of alcohol

consumption in the laundress quarters. Of the 21 (MNI) identifiable glass bottles from 2007 excavations, 14 are identified as alcoholic beverage bottles. Beer bottles make up almost half of the containers (10 count). One whiskey and three champagne containers were also recovered and identified. The rest of the identifiable glass pieces are patent medicine bottle. Patent medicine at the time contained astounding amounts of alcohol from 15% to 42.6% in specific remedies, at times consumed solely for the alcohol content (Weiss 2011).

In the 2017 season, more features of the building were uncovered that lend to increased understanding of the construction and possibly the dimensions of the quarters. There was already a good amount of data on the quarters from previous years and the investigators wanted to gather more information to determine the dimensions and function of the room. From the measurements of the room, the investigators could get a better sense of the dimensions and scale of the rest of the fort, as the only contemporary map was drawn before construction finished and is not drawn to scale. Structural beams were encountered that formed the walls of the rooms. The beams were laid down horizontally with adobe chinking between them, a detail encountered in another part of the fort in 2011. Two of the beams ran parallel to each other and could have been the east and west walls of a room. In 2013, the digs turned up a living surface and part of a fireplace, as well as metal and glass artifacts (Goddard 2011,2013).

Conclusion

Studies that examine the people and places regularly overlooked or textually underrepresented in written history are vital to gain a fuller understanding of the past. When archaeologists combine the approaches and analyze textual and material evidence they help expand our knowledge on the past. In the case of Western archaeology, investigators have the issue of underrepresented groups as well as the popular narratives that do not tell us the whole story. Specifically, archaeologists working on Fort Massachusetts have limited contemporary information about the fort and the day-to-day lives of the garrison because of its brief lifespan.

The archaeological work being done in frontier outposts such as Fort Massachusetts and its successor in the San Luis Valley can help the public and researchers understand the fuller picture of the American West at the time of its integration into the Union. This means including underrepresented groups and their experiences in the new frontier into the discussion of history of the West and the U. S. Army in the 19th century. The site has already proven itself a rich resource on the lives and experiences of those on the lesser recognized side of the past. Work on the fort revealed more about the living arrangements of the

women and their everyday surroundings than contemporary records do. The material culture also discloses the parts of daily life that would likely not be ever written about. These can be the work activities of the laundresses, like where they would prefer to carry out their duties, to more personal details which include their lifestyle choices such as their values, how they expressed them in their new surroundings, and drinking and drug habits. By drawing from archaeological evidence and the historical records that puts the material culture in context, can help us gain a fuller picture of the history of the American experience. In the case of women attached to forts, a much more complex and nuanced view arises from these investigations.

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Identity Unearthed

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Abstract

Archaeologists are tasked with understanding the past through its material remains. This includes reconstructing the identities and life histories of the site's occupants as, individual people and a collective group. This article addresses how archaeologists and anthropologists use cultural artifacts, burial locations, and identifying features on human remains to examine and assign identities. Three case studies help to elucidate the formation of individual and collective identities in the traditional archaeological sense. National identity will be explored with a modern case of Romania utilizing place myths and pseudoscientific data to push for a national identity. A case of a Viking burial in Iceland will illustrate how grave locations and context allows archeologist derive local identity. While the famous case of King Richard III allows for the explanation of individualization as obtained in an anthropological aspect. This paper is meant to highlight the complexity of identity studies and the need for archaeologists to be more involved in in the application and representation of their findings.

Keywords: Dracula, national identity, Romamia, Vlad Tepes, place myth

Introduction

Anthropology is the study of human beings both past and present to understand the evolution of our existence through spatial orientation, culture, language, and origin. Anthropologists require the use of archaeology and cultural research to expand our knowledge of groups of different customs and heritages. Archaeologists look at the spatial orientations of buildings to understand group formations. Researchers have found that the level of leadership established at any location has often been correlated in the orientation of the groups' buildings. Nomadic hunter and gatherers tended to have housing that was not permanent, often consisting of a few post-and-thatch conical style houses. While we see those of more industrialized settlements, consisting of states and chiefdoms, with clear leadership, have permanent dwellings with patios, multiple terraces, individual rooms, specialized rooms for different tasks, sometimes burial locations, and the tale tell sign of system of leadership are the presence of monuments.

Spatial building layouts can give a general idea of how many people could have been living there and what activities were taking place. Local identity is based on what is attributed to the general area, such an example would be pottery styles that reflect the areas which they are from. An area could be known for producing a certain shaped bowl, a specific pigment of paint, or quality of clay. A local identity can be linked to a changing of ideology over time with origin myths and

special rituals that take place, while a national identity is credited to all polities that are controlled by a single ruling person or group. Lastly, an individual's identity can be marked by their profession, ideology, daily activities, the sort of health they are in, and a multitude of factors that differs from person to person.

A national identity is an image that is attributed to every inhabitant by people living outside of that group despite the regional variances. This outside perception could be facilitated by the national leaders through policies and international relations. A consequence of an expansive identity is the lack of diversity and authenticity. Local identity tends to be related to goods and services that produce significant economic gains. For instance, California is known for Silicon Valley, wine, nuts, and Hollywood yet none of these classifications grasp the full extent of individual identity.

In non-literate past cultures, individuality can be explored archaeologically with physical remains usually involving their grave goods and through determining how healthy the person was during life. Harris lines are marks of growth arrest striated on bones, where the bone stops growing for a period of time, indicating malnutrition or extreme sickness stunting growth, similar lines can be examined on teeth. What a person is buried with can discern religious affiliation, status, reputation, and a slew of other features.

This is how archaeologists and biological anthropologists arrive at the different classifications of identity in past societies. To further expand on this point

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I will focus on three case studies, each of which tackles a different area of identity. For an idea of local identity the “Axed Man of Iceland” will be examined, while for an individual assessment the notorious King Richard III will be an excellent assemblage of biological anthropology, lastly a relatively new concept of national identity and the culmination of modern nation building will explore the myths, legends, and distortion of “Vlad Tepes Dracula.” All are intended to address the complications of identity and how its study can tend to get away from anthropologists and used not for the benefit of history or accuracy but rather for monetary and prestigious gains. Archaeologists should have more control of their intellectual discoveries and how these are portrayed to the world; all anthropologists and historians should work together to insure that groups and historic figures are depicted accurately and not exploited. Thus, this paper is addressing and outlining both the difference and the problems faced when attributing identity.

Local identity

To obtain local identity anthropologists use multiple clues left behind in the soil from earlier civilizations to try and gain a deeper understanding. Major clues include: grave location, buried artifacts and goods, as well as skeletal remains. Each of these are vital in accessing identity and all will be examined in the case of the “Axed Man” of Iceland, named for the means of his death, an axe blow to the head. However, before there are any remains to unearth there is first a story—oral traditions, sagas, or supposed “eye witness statements” that archaeologists follow as potential leads in investigating a site. In most cases they already have an idea that there is something within the vicinity because archaeologists conduct their work in areas with enough evidence to suggest that ancient civilizations lived in the area, or where they know battles are documented as having taken place. Such is the case with Viking occupied Iceland. By knowing the historical occupation there is likely a chance of finding remains of these groups.

To identify structures archaeologists look for traces on the landscape, including mounds or small hills that may contain a building covered up over the years with soil and debris. In other cases the mission is to find a specific burial such as the case with Tutankhamen or K’inich Yax K’uk’ Mo’ or any great ruler. When there may be an indication of a grave location in written records, that is combined with oral histories and stories to guide excavation.

In the case of the Axed Man, investigators were looking for Egil Skallagrimsson, but produced another puzzle that will help us explore identity. The saga used by the team of investigators states Hrisbru church is the

place where Egil was buried before being removed and buried at a new church built at Mosfell. In trying to find evidence of this reburial, the researchers turned to another oral tradition, which suggested that a small knoll behind a horse barn in the region was known as “Church Knoll”. This is a shocking find because there wasn’t evidence of any architecture detected below the surface when using modern technology such as a magnetometer to look below the ground surface. The researchers found the structure only after hearing the oral tradition by chance and following through with the search. After digging, the site was found to have evidence of domestic activities, graves, and building structures proven to be the remnants of the Hrisbru church. Investigators found the remains of the Axed Man and, as the following discussion details, through a rigorous process of identification, the archaeologists were able to make attributions of race, religion, sex, and migration patterns to the interred individual to better understand such relationships in the area.

Sagas were used to aid in the discovery of a homicide victim in Iceland dating back the age of Vikings, 800-1066 AD. The main feat was determining where this person came from in order to attribute an identity and understand what lives were like at this location. This can be done with the examination of the grave layout and any grave goods. To begin our assessment we should identify if the victim is in fact a Viking or some other descendant. In Iceland, Christianity was not adopted into law until 1000 A.D. Previous to this time, Iceland’s Vikings practiced paganism. The first settlers would have been practicing paganism and slowly converting to Christianity as they settled into Iceland. Thus, we need to know if he is one of the first Vikings coming in or a part of the second generation born in the area. The archaeologists eventually came to assign his religious affiliation as Christian and, because of this, he was determined not to be a part of the first wave of Vikings, but rather a member of the first generation to be born there after settlement. In this area, pagan graves are recognized by extensive grave goods, including sacrificed animals, buried with them and these were not present in the Axed Man’s grave. The only grave goods were a bit of organic material, likely leather, and a Viking age pin used like a broach to keep their cloaks back while fighting. In addition, the remains were orientated with the feet facing to the east, towards Jerusalem, which is common in Christian burials. Furthermore, he was buried near the church’s chancel, which is an indication that, not only was he Christian, he was also viewed as being an important pious person of high rank within the church hierarchy. Taking into consideration all this evidence, the role stories play in tracking down archaeological sites, as well as the ways that grave orientation can be used to aid in identification, is a vital source of

information. Recognizing the different grave layouts in the two groups helps to understand the local identities present in the area, and to which group the Axed Man belongs. (Stodder, 2012)

Individual identity

Looking at how physical remains can contribute to the identification of a person, we can turn to the famous case of King Richard III. Many people already have some knowledge of this case and it is a textbook example of identification through skeletal material. In September of 2012 a skeleton thought to be that of Richard III was discovered below a parking lot in at the Church of the Greyfriars in Leicester, UK. Although there are skeptics that do not fully support the positive identification, the process can still serve to demonstrate the effective uses of biological anthropology and its challenges when dealing with historical figures. Resembling the case of the Axed Man, a saga, was used in linking King Richard to the site of excavation at the choir in the church of the Grey Friars. This information was provided in accounts of John Rous, an associate of King Richard's, while the pathology was compared to literary accounts, one of the most famous being Shakespeare's representation of Richard III.

The evidence used to link one body to another is similar in historical cases as well as in the case of missing persons. The estimation of sex, age, rare bone disorders, and ante mortem fractures or surgeries, are all used to distinguish one person from another. In special cases DNA can be used, and in dealing with subjects of the past we can use isotope analysis to determine diet and migratory patterns of an individual or group, or we could use radiocarbon dating which dates bones to a specific era. The body assumed to be King Richard III was estimated to be between 30 and 34 years old consistent with the age at death of 32 years of age reported for the king. This was determined by the standard practice of comparing measurements of cranial sutures, the face of the pubic symphysis, auricular surfaces, and sternal rib ends to those of individuals of known age, but with the more precise analysis of a CT scanner. These all have attributes that change with age; for example, fusion rates, in which one part of the bone fuses with another to become more solid, are different depending on the part of the body. The other means of determining age is the balance between the formation of bone and then the subsequent wearing down of bone. This is usually evident, for example, in the pubic symphysis where the two halves of the pelvis are connected in the front of the body. The adult man had a gracile build with severe scoliosis to the thoracic spine and a raised right shoulder, which is conveyed in many reports of the King, this abnormal formation of the

spinal column is an individualizing trait (Appleby, 2015).

There is speculation about whether or not these remains actually belong to King Richard III simply because it is so hard to make that determination when dealing with a famous figure. Mitochondrial DNA, mtDNA, is similar to regular nuclear DNA but with fewer base pairs, and instead of having one half of the genes inherited from both parents, it is only passed through the maternal line. MtDNA is often used in the study of non-contemporary remains because of two key factors that make mitochondrial DNA more beneficial than nuclear DNA. Most important when handling ancient remains is that it doesn't degrade as easy as nuclear DNA, human remains degrade over time and it is more likely that mtDNA will persist. There are also thousands of copies of the mtDNA, making it more likely to survive giving geneticists plenty of product to work with, while nuclear DNA only has two copies per cell. It can also be used to trace family lineage through the mother's line, requiring only one half of the genetic makeup for a successful identification. This has caused disputes in dealing with the case of Richard III, because any child of his female ancestors would have the same mtDNA as him. So, there could be many individuals that share the same mtDNA including any children from sisters, aunts, and grandmother, which is the main complaint of Michael Hicks, head of history at the University of Winchester (Mason, 2014). However, this is the very reason we are able to link the supposed remains of the King to known descendants of his sister Anne of York. By analyzing stable isotopes researchers can gain insight into the diets of individuals, in this case 25 percent of the diet consisted of seafood historically indicative of high status, while radiocarbon dating gives an estimated time of death; AD 1456-1530 (Buckley,2013). Even though radio carbon analysis can date a set of remains, it is not specific to a year but rather a range of years, "It will give you an era, but nothing more. In this case, it covers a period of 80 years - *Michael Hicks*" (Mason, 2014). In spite of these arguments it is important to remember that individual identity is a compilation of many factors. If we had a set of remains that only had scoliosis but was buried in the wrong time or place then it would be significant or if we had an individual of the right age and from the correct era but did not match the many literary accounts then a positive match could not be made. In this case we have multiple lines of evidence pointing to these remains being from the King. Although it is hard to conceive that there is a body 30 years of age, dating to the middle ages, with severe scoliosis and a raised shoulder, found at the reported area where King Richard III was said to have been placed, and yet not be the body of the King, these are the issues that arise in historic cases.

National identity in Romania

“In a country where ethnic tensions between Hungarians and Romanians simmer, where the natives grumble about their old enemies, the Turks, buying up businesses in Bucharest and where national myths have a way of becoming political reality, allowing vampires to eclipse the real Vlad Dracula is one step toward making history a means to an end” (John, 1995).

The previous two case studies highlight the use of stories and to continue on this theme archaeologists also used legends to help find the remains of Vlad Dracula, Prince of Wallachia (one of Romania's principalities). Archaeologists were lead to a possible grave at the historical location of Snagov, Romania. In this case study we have an identity with no physical proof displayed unlike in the other case studies. The short report presented by the researchers has only brief descriptions of the grave findings that are not up to anthropological standards for positive identification, so it contributes very little to our discussion of identification of this iconic figure and the supposed inspiration for Bram Stoker's Dracula. This lack of information can be attributed to the lack of an excavation report due to the “state socialist era (1947-1989) In any case, access to socialist-era archives is notoriously difficult for non-Romanian researchers” (Light, 2007). The control of Socialism had the country isolated from the rest of the world and strict control over what knowledge is allowed to be accessed. It has proven a challenge to procure any form of the excavation report in order to prove the claims of a positive identity or offer other areas for interpretation. Mei Trow author of *Vlad the Impaler* states “the written record is very sparse, the archaeology, by comparison with great civilizations of the ancient world, is sparse as well; we don't know what actually is out there.” Another area of legends to be explored relates to how Vlad claimed his notoriety, known for impaling both his foes and law breakers in his own kingdom, earning him the name; Vlad the Impaler. While the claims of warring suggest there should be hundreds of examples, there is no accessible archaeological documentation of evidence substantiating this method of execution on physical remains found in the region.

George Florescu and Dinu Rosetti, excavated the grave of Vlad Dracula in the 1930s at the site of Snagov. Snagov is said to have been transformed from a slightly fortified monastery into a monastic island fortress completed by Vlad himself. The locally held belief places the tomb of the prince at the foot of the altar, “so that the priest and the monks could read the Gospel and say prayers for the permanent repose of his troubled soul” (Florescu 1973,125). Upon excavating, this grave was found to be empty and the burial reported

was found at the back of the back of the church near the portico, a covered porch (Florescu 1973, 127). An ill-fitting hypothesis suggests that the grave of the prince was removed in an act of vandalism to remove a ‘monster’ from such a pious position to one where visitors could trample his remains and erase any trace of him. Below the tomb plate was a degraded casket shrouded in a purple cloth embroidered with gold that was also deteriorated. There is mostly post cranial remains but there is too much damage to determine if there is a skull present or not. In addition to not knowing much about Vlad's reburial there is nothing reported on the bones and the examination process, unlike the careful excavation and documentation of the remains of King Richard III. The only grave goods reported was a ring. This hardly supports any identification, and all interpretations are dependent on the various reputations of Vlad that an investigator chooses to highlight. They could use the reputation of his being a blood thirsty monster and state that the grave was removed along with any trace of him for this reason, or they could reason that the grave was moved along with any identifying markers on his tomb plat to prevent looting; after all, why would they go to the trouble of reburying a monster?

Vlad Tepes (the Impaler) Dracula was known for his reported means of torture of impaling people on spikes surrounding his principalities. The method would be used for a slow gruesome death meant for prisoners Vlad felt were not deserving of a quick death as the wooden stake worked its way up the rectum and through the intestines. His bloodlust has been famed in legends and myths despite the fact that they were most likely hyped by his enemies or his own men to deter attacks. Nevertheless, Bram Stoker's Dracula has been credited as being based on the “Vampire Prince.” Although it can be argued that it is a simple loose attribution. Either way, the popular story based in Transylvania has tourists flocking to Romania in search of vampires. The problem is the competing dichotomy of identity forced onto the people of Romania and how they see themselves. In his writing of Dracula and the way in which he describes Transylvania, Stoker created a “place myth” that is carried on today in other books and movies. A place myth can be seen in other areas such as Stonehenge with myths of aliens, the supernatural, and religious pilgrimages taking place there. Another place myth comes from “Area 51” known throughout the United States for harboring aliens. The two examples given are meant to better explain the reach of place myths, the only difference with Stone Hinge and Area 51 to Transylvania is that the place myth extends to cover the entire region and has crossed over to represent the entire country of Romania and its people. The place myth for Transylvania promotes the idea that the country is a horrific, supernatural, backwards place. A reputation

such as this creates a primitive image that persists because of the popularity of the legends.

The image is at odds with how Romanians see themselves and their former ruler. "The association with vampires and the supernatural is at odds with the country's sense of its cultural and political identity as a modern, developed European state" (Light, 2007). Travelers coming to their country only to solidify their expectations of the land of vampires is an insult to their actual history and to a nation desperately trying to prove they belong as a part of Europe. Romanian people often see Vlad Tepes Dracula as being a "national hero and a sort of 'founding father' to the Romanian people" (Nicol, 2002).

A brief background sketch may be needed to explain the idealization Vlad has among his people. His hatred for the Ottomans and the Boyars began in his childhood while he and his young brother, Radu were kept prisoners and raised by the Turks in exchange for his father's freedom and as an assurance that his father stay out of the Turks' war. Later Radu would pledge his loyalty to their captors, the Turks, over his own brother Vlad. Meanwhile the Boyars removed his father from his voivode, principle commander of a military force, by executing him and his oldest son Mircea. These Boyars would later become the infamous five hundred bodies reportedly impaled by the prince. Turkish rule was expanding, spreading Islam into any conquered land at a rate alarming to Christians in the surrounding areas. Vlad and his father had pledged their allegiance to a league guaranteed to protect Christianity known as the Order of the Dragon. In fact, Vlad's name, "Draculea," later to be known as "Dracula," derives from the word for dragon, "Dracul". Vlad reaches out to Hungary and to the Pope for aid in his rebellion against the Turks but no one would commit to fight by his side. For this, Vlad is regarded as a protector of Romania from invaders and the protector of Christianity. He is thus a hero in the eyes of Romanians, although the accounts of his violent acts are seen as being just by his people and heinous by modern readers, they are not out-of-the ordinary for the 15th century.

Despite the government's direct objection to the reputation of the nation being a supernatural, vampire-stalked place, there is money to be made in tourism. The forms of tourism a country chooses to promote and the audience they target perpetuates the country's sense of cultural and political identity. "Through such decisions the state adopts the role of the definer and arbiter of cultural meanings" (Light, 2007). In distancing itself from the Soviet Union it was imperative that Romania establish national independence. There is a shift in focus of advertisements to tourists, in the beginning the country emphasized beach resorts near the Black Sea, the ski resorts of the Carpathians, or the cultural heritage of Transylvania to fit the expectations of the Dracula

enthusiast coming from the West. "Romania's position has been to deny any association between Vlad Țepeș and Count Dracula, a stance that underpinned the country's response to the growing popularity of Dracula tourism in the 70s (Light, 751)." Throughout the 1960's there was an increase in western tourists coming to Romania seeking the legend depicted in the cinemas, hunting for vampires and an ancient castle that did not exist. In fact there was never any concept of vampirism in Romania folk stories and even Stoker's Dracula was unknown until 1990, long after its creation. The most popular tourist attraction known to most westerners is the infamous Dracula's castle, the Castle Bran. Its popularity, however, is highly criticized as it was not even lived in by the prince, rather it was sought for refuge in the 1450's. A much better candidate for Vlad's castle is Castle Poenari bordering Wallachia and Transylvania. Castle Bran is more closely representative of Bram Stoker's novel than the royal residence.

The stance the Romanian government has taken varies between protecting their national heritage and giving in to the tourists' expectations. For the most part, its efforts have been to underplay or to fully disassociate the historical figure of Vlad Tepes Dracula from vampirism and protect cultural heritage by promoting their vast landscapes, rural traditions, and spas for visitors instead of emphasizing the Dracula myth. In fact, after socialism, Romania was desperately seeking to be seen as a part of Europe, but being isolated for so long and without the wealth of most major European nations the countries organizers sought a quick way to gain notoriety and present itself to the world as a place to be sought after. The state tried to expand on the Dracula tourism already established, capitalizing on the Western myth to create a Dracula theme park. The plans were ultimately canceled not only because it was in pore taste with Romanian people but also because it impinged upon protected historic forest and other historic settlements already included on the UNESCO World Heritage list. It threatened everything the country had hoped to accomplish resulting in its being perceived as not fully European.

The national center for tourism is responsible for advertising to the rest of the world what major sites their country has to offer. Most travelers do not do in-depth research about their vacation destinations beyond what is advertised to tourists. Both in the great early civilizations of the Maya and our case study of Romania modern citizens are having their history dictated by tourists' expectations not necessarily on historical fact. Tourists' experience can drastically shape the lives of those who need tourism to survive. Households in San Antonia Aguas Calientes transform their home from a modern living area with amenities such as a T.V. to resemble what is thought to be an "authentic" Mayan home, traditions untouched by time (Little 2000).

Another way to alter perceptions of tourists are through maps such as those used by tourists when exploring Mayan sites and those used to guide you through the Yucatan which rank sites based on their touristic appeal even if archaeologically they are less significant than others that are dismissed by the guidebooks. "It is thus the guidebooks, not Maya archaeologists, which predominantly set the touristic itinerary" (Ehrentraut 1996, 17). This is the same theme we see when looking at Romanian tourism. The Ministries shift from landscapes, cultural heritage, and the historically significant Black Sea to emphasize a myth that both; lacks authenticity and defines the country as backwards and primitive is a formation of National identity disconnected from the thriving modern world it truly is.

While attending an archaeological field school in Romania in Summer 2017, I spent two weeks in Bucharest, and can attest that it is a modern city with tightly packed streets, night life, and a city scape similar to any western city. I was expecting that, because of the large reputation of Dracula and the country being pulled into the legend, that the people would capitalize on the opportunity. I expected them to cater to this image pushed onto them simply for the economic benefit, but, in reality, the closest attraction was hours away. The group I was with was in search of souvenirs and it was hard to find a single shop that sold "traditional" items or "Dracula" items. The only place we located such objects was in Lipsca a square plaza hidden like a labyrinth, catering to the night life mostly comprised of places to eat, plenty of stores for art and clothing but very few shops having something to sell that involved vampires. The items usually correlated the historical Vlad Tepes Dracula and the blood thirsty vampire, or it related Vlad to Castle Bran, yet these tended to be at the back of the store while normal merchandise and traditional pottery art was highlighted in the front. From this experience I can say that the locals do not push tourists towards the vampire myth or towards the castle; there were no ads at our hotel and most of the shops focused most of their inventory to traditional pottery and other general items.

Conclusion

There are many ways to form identity using anthropology and archaeology as seen in the three case studies. The problem of identity becomes harder when dealing with historic cases such as King Richard III and Vlad Tepes Dracula. There is also the problem when looking at national identity versus individual identity. National identity presents a stereotype that does not correlate to individual identity, yet if a region relies on

tourism for survival then they will be more likely to change their identity and actions to meet tourists' expectations. Seeing the growth and development of identities can elucidate not only the environment but also the social interactions and possible degradation. Archaeologists can see minute clues that will facilitate an identification, beyond this there is little control of the findings. Identity is not one factor but constructed on multiple levels of reasoning that tourists do not always see when they are in search of authenticity. To combat this archaeologists, anthropologists, and historians should be more involved in the outreach process as well as in the portrayal of identity.

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The social rise and demise of the Ancestral Pueblo: A look into climate change and the societal reaction in Chaco Canyon

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Abstract

The Ancestral Pueblo inhabited the Four Corners region of the American Southwest from AD 750-1300 and built a complex society. Their collapse in the early 12th century has been the subject of many archaeological studies and intense scholarly debates. In this article I examine a case study of their societal reactions, by way of violence and outmigration, to the climate change that preceded their collapse. The constantly changing climate in the American Southwest is an important topic to study, because it provides archaeologists with insight into cultural responses to the dramatic environmental change. Archaeological evidence demonstrates straightforward signs of migration from Chaco Canyon to more hospitable areas throughout the region, and in extreme cases violence that sometimes led to cannibalism. If scientists can gain an understanding into the ways societies successfully dealt with climate change in the past, it can help us understand how societies can better react to such drastic changes in climate in modern times.

Keywords: archaeology, dendrochronology, migration, American Southwest, climate change, Ancestral Pueblo, Chaco Canyon, Mesa Verde, Anasazi, drought, Pueblo Bonito, Cliff Palace

Introduction to the American Southwest and the Ancestral Pueblo

Looking into the societal reaction of the Ancestral Pueblo to climate change is something that could help modern societies better react to such changes differently than how societies reacted hundreds of years ago. The American Southwest is defined as the area from Durango, Colorado (in the north), down to Durango, Mexico (in the south), and from Las Vegas, Nevada (in the west), over to Las Vegas, New Mexico (in the east). Within this region is the Four Corners area, where four states, Utah, Colorado, New Mexico, and Arizona, all meet in one spot. The Southwest has a wide variety of climates ranging from heavily forested mountainous areas that are with an overabundance of rainfall, to deserts with little to no rainfall. The Ancestral Pueblo were a group of Native Americans that lived in the Four Corners region (Fagan 2011).

This article is a case study of the Ancestral Pueblo living in Chaco Canyon, in northwest New Mexico. Chaco Canyon is a region in the San Juan Basin, and the three main great houses in the area were Pueblo Bonito, Una Vida, and Peñasco Blanco (Harrod 2012). They were previously called the Anasazi, a Navajo word meaning “enemy ancestors” (Childs 2005). The living descendants of these indigenous people find the name to be derogatory, so the accepted term is Ancestral Pueblo.

The Ancestral Pueblo lived in the Four Corners beginning around AD 750-900 (Fagan 2011) and remained in the region until roughly AD 1300 (Axtell 2002). They thrived in the region and developed a complex and well-established trading system with tribes located within a few hundred miles in every direction.

The staple diet of Ancestral Pueblo was maize, beans, and squash. This triad is nutritionally beneficial for all who lived in the region, because it provides all the essential amino acids needed to build proteins in the body. The plants also have a symbiotic relation when grown together. The squash’s broad leaves create shade, maintaining soil moisture and inhibiting weed growth. Maize depletes the ground of the nitrogen essential to nourish the plants but the beans release nitrogen into the ground to make up for the maize and its consumption (Fagan 2011).

Chaco Canyon settlements

The sites in Chaco Canyon were all very similar to one another. While the overall architecture of each of the sites were different, they did have a lot of the same features in the sites. The masonry was done with local rock that was cut and then used to build the structures. The sites also were known for having kivas for different ceremonies, and an abundance of smaller, more commonly used rooms. Most of the smaller rooms were

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for everyday practices, such as their usual work duties, or even just rooms to sleep in. Some of the practices included working semi-precious stone, or just working shells for their religious ceremonies. The larger of the rooms used for everyday use are believed to have been used for those of higher statuses, whereas the smaller rooms were for those who were workers or just non-elite inhabitants (Fagan 2011, Plog 2008).



Figure 1: Pueblo Bonito
(after <http://www.hiddenarchitecture.net/2016/01/pueblo-bonito.html>)

Pueblo Bonito Greathouse

Ancestral Pueblo settlements are commonly located in Chaco Canyon Sites ranged in size from that of something small, like the site of Wijiiji (smaller, with only two kivas) up to something larger, like the site of Pueblo Bonito (Figure 1, with 32 kivas and three great kivas; Fagan 2011). Archaeologists recognize Ancestral Pueblo sites through the architecture of the sites, and the presence/usage of kivas. The typical Ancestral Pueblo site had a lot of the same features. The site of Pueblo Bonito had around 1,200 inhabitants at its height. Other than the great kivas and the smaller kivas, they also had trash middens in specific sections of the communal area (primarily east or southeast) and more storage rooms for food preparation and other lifestyle practices. A kiva is a subterranean circular structure used for religious rituals or political meetings. Kivas have their origins in the Basketmaker period (1200 BC–AD 50) of the Ancestral Pueblo. (Plog 2008).

Ancestral Pueblo settlements were arranged uniquely when compared to other sites in the same geographical region, and best exemplified by the site of Pueblo Bonito, and the other sites, in Chaco Canyon. The site of Pueblo Bonito is arranged as a half-circle great house, divided in two by a wall that goes almost completely down the middle. On either side there are big, open areas used for socialization and other ritualistic practices. Within the open areas there are also great kivas, which are for all the individuals that live in the site, and around the perimeter of the site there are

much more smaller kivas for specific, more individual practices of smaller groups of people.

Climate change begins

During the 9th century, the rainfall north of Chaco Canyon became sparse, which caused the inhabitants of Chaco communities to migrate south to live with the Ancestral Puebloans. This meant their communities were able to flourish with an abundance of people in the area. They were able to maintain the area, and the labor needed to allow the community to thrive. Around AD 1115 the Chaco trading system had branched out hundreds of miles to many other communities in the region. Some of the items traded were animal hide, foodstuffs, and shell beading used for religious ceremonies (Fagan 2011, Plog 2008).

Around AD 1130 a drought began that lasted fifty years. Tree-ring dating, or dendrochronology, is done by analyzing the individual rings of trees that form annually. Tree-ring analysis was pioneered in the American Southwest by an astronomer, A. E. Douglass. A year by year account of temperature and climate variability at Chaco Canyon has been found in tree-ring data from the area. By analyzing the width of these rings, archaeologists can reconstruct the year by year climate changes that a tree from the region experienced. The trees thrive, leaving wide rings, when there is plentiful rainfall but grow very little in drier years. The tree rings are sometimes not as helpful as archaeologists would like, because logs can be replaced or reused throughout the use of a site. This can make dating more difficult, because the dates only match the age of the wood used and may be older or younger than the age of a building they are found in (Kelly & Thomas 2011, Plog 2008).

Once the climate began to change, the Ancestral Pueblo responded like other societies had done for centuries in this region, they relocated. Following the climate change in the region, the most logical reaction was to relocate to a more inhabitable environment. After fleeing Chaco Canyon, many of the Ancestral Puebloans migrated north to Mesa Verde. By the 1300s, archaeology shows Chaco Canyon was completely abandoned, because of the scarcity of the water, and the inability to provide themselves with the necessary food. The archaeological evidence shows they might have also traveled south and southeast towards the Hopi, Zuni, and the Rio Grande Pueblos. This is also found in some of the oral histories of the current people living in these regions. The oral histories are something these people hold very high in their beliefs (Fagan 2011).

Many of the people who migrated towards the south remained there and adapted to the new environment they had found, even going as far as adopting the customs and beliefs of their newfound neighbors. The belief of kachinas being one of the most important. The

belief of spirits coming from the underworld, are present and communicate through specially chosen individuals, and represent the spirits of their ancestors. They were finally settled into the new tribes by AD 1450 (Fagan 2011, Plog 2008).

Social reactions and outmigration due to climatic changes

After the climate change started to cause social changes within the communities, life for the Ancestral Pueblo started to become more difficult. With the scarcity of foods, there was more competition for the food that was present and more competition for the resources. The tree rings show many years of abundant rainfall, which would coincide with the thriving years when the communities were at their highest trading capacities. During their best years, the crops would thrive with bountiful harvests, and the trading network would reach as far south as Teotihuacán. It is believed they traded things as simple as shell beading, to maybe even chocolate (M. Lauriers, personal communication, April 2018). However, there are also many years of droughts, which would also coincide with the years in which they did not have enough goods for themselves, let alone enough to trade with anyone else.

The question as to whether the temperature affected the land and their communities came to around the year AD 1200, when the seasons became shorter, which meant there was not enough time to grow crops to sustain the society for the longer winter months needed. With less agriculture to help sustain them, they would have to resort to hunting and gathering much more. This would also put a physical strain on those living in this region, because the lack of rain would have made the weather much more unbearable at times for them. They would have been used to much shorter droughts, however the much longer ones would have been something they were not accustomed to adapting to. This was not a sudden change, because the drought last fifty years, but after many years with shortened crop-growing seasons a drastic change would have been seen (Salzer 2000).

Salzer (2000) discusses the ideal situation for maize to grow in being around 19°C, with a strong indication of if being able to grow in 10°C-40°C. However, during the droughts of the years in which Chaco Canyon started to show signs of some struggle, those temperatures were likely much higher than the ideal. This is because of the lack of the rain in the area needed to cool the ground to a sustainable temperature. Without the rain, it became a bit of a snowball effect in not only not cooling the ground, but also not enough water to keep the crops alive, and then not enough crops to sustain the people, and eventually not enough resources, which leads to many different problems.

There is also some evidence of volcanic activity around the polar ice caps coinciding with the failure of the crops and the lack of the rain. The volcanic event is seen in polar ice cores melting dating to AD 1259. This caused a warming event globally. The atmosphere filled up with gases that caused the overall temperature to rise. This caused an almost tropic weather pattern, and in turn caused the weather to be dryer (Salzer 2000).

Violence would also have been a bigger problem for those inhabitants of such a drastically changing area. When resources begin to become too scarce, people start to panic. This is what happens in modern times, and this is evident in archaeological contexts as well. Such as some site found in within the Ancestral Pueblo region of the Southwest of piles of bones at the bottom of cliffsides from people being pushed, or tossed, of the edges.

Another social change coinciding with the climate change is the archaeological evidence of cannibalism among the Ancestral Pueblo. There is evidence of violence leading up to the cannibalism, however cannibalism is the extreme case. This was not a common occurrence, and there are just a few examples of this in the archaeological record, however it is one of the effects of climate change, nonetheless. In 1967, Christy G. Turner II looked at the remains of some 30 humans from sites in Arizona. He claims to have found “cut marks and burns, just like animal bones that had been roasted and stripped of their flesh,” (Gibbons 1997).

The problem with interpreting cannibalism is the negative connotation attached to the interpretation. The descendants of these people do not ever want to believe their ancestors could have ever done such a thing, and the communities are very sensitive to such claims. Also, the cut marks on bones could have been misinterpreted and possibly were simply animal marks from being exposed, and later moved.

Some strongest evidence for cannibalism comes from a series of sites in Cowboy Wash, Colorado. There, archaeologists found evidence of bones with cut marks and pot polish on them. Pot polish happens when bones are processed, or cooked, in a pot. From being cooked, the ends of the bones get this smooth, shiny surface to it where it was rubbing against the side of the pot. There were also bones broken apart to have the bone marrow extracted, and likely eaten. There is evidence of roasted heads, amongst the others aforementioned.

There is evidence of cannibalism in a coprolite found in a site called Cowboy Wash, Southwest Colorado. This was discovered when anthropologist, Karl Reinhard, did a coprological analysis of the specimen. This coprolite showed evidence of myoglobin, which is only found in human meat (Marlar et al. 2000). Originally when the coprolite was found, science was not advanced enough to do an analysis to determine whether there was any evidence of

cannibalism. After coming back to the coprolite some years later, the science was advanced enough to show that the coprolite had evidence of a human protein that is only present in human meat, which would have only been in the feces if it had been ingested (Reinhard 2006). The one downside to coprological evidence is it only shows the last meal before it was deposited, so interpreting the finds could be a little difficult. Whether this was an isolated incident or not based on the one find is not enough evidence. Archaeologists must look at all the evidence.

Mesa Verde settlements

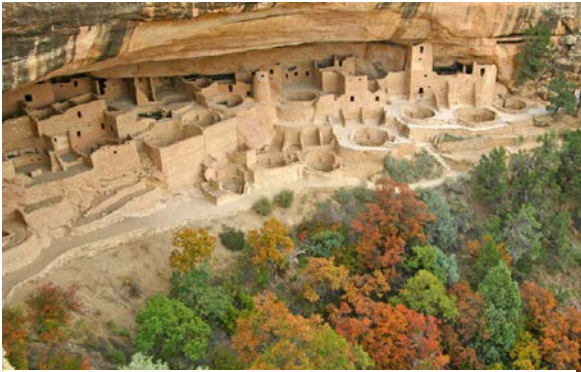


Figure 2: Cliff Palace, Mesa Verde
(after <https://www.mesaverde.org>)

Cliff Palace

The architecture of the sites in Mesa Verde was different from that previously found in Chaco Canyon. To contrast, the cliff dwellings in Mesa Verde were vastly different because of the structures being built into rockshelters. About 250 people inhabited Cliff Palace (Figure 2) when at its height. The area of Mesa Verde was much more secure for those who lived there. The access to the site is much different than the access to the sites they previously lived in. Residents of these sites needed to climb down from the mesa to the rockshelter, and this is safest only to do during the daylight, as there are only hand and foot holes made by these people to descend into the dwelling. The cliff dwellings also protected the inhabitants from the elements by providing natural barriers on three sides. The structures were often up to four stories high. This is because the Ancestral Pueblo were not as spread out in Mesa Verde as they were in Chaco Canyon. The kivas were also arranged differently. The kivas continued to be constructed as subterranean religious rooms, but because of the lack of space, they were many stories high as well, and not as spread out when compared to Pueblo Bonito. Some also being multi-use, as well as ceremonial rituals (Plog 2008).

Another difference of living in Mesa Verde, the people had to climb up to the top of the plateaus to tend their crops. With not much room down in the cliffside,

they had to utilize the resources they had. This was a dangerous task, because of the need to ascend ladders or steep trails to reach the top. However, the inhabitants were able to be safe once down in their houses (Plog 2008).

Discussion

The social rise and fall of the Ancestral Pueblo of great interest to archaeologists. The great preservation of the sites helps us investigate the past that is almost impossible at other sites. By the 12th century AD, the fall of the sites is evident. With the drought lasting 50 years, at least three generations would be able to see the effects of the failing crops. The lives of people were inevitably affected by the changing lifestyles in the Southwest, out of necessity.

The climate change in the American Southwest is something that is evident in the archaeological record through dendrochronology. By analyzing the tree rings and the continuous cycles of plentiful rain and drought, modern climate changes might be able to be understood a lot easier. The unique preservation of these two sites allow archaeologists a look into the past that would otherwise not have been possible. With the ability to investigate the past, and the cycles of the climate change, scientists could try to predict potential shifts in temperatures. With the ever-changing climate of today, learning from our history is something that is of utmost importance. By learning from the past, we can plan for our futures.

The study of the ways societies has reacted to such drastic changes in the past can also prove to be difficult. When thinking of the fact that the descendants of the people in this study do not believe a lot of these claims, we anthropologists must be careful. The archaeologist studying the sites in question must also take ancient beliefs into consideration, to show respect to these people in the study.

Archaeologists must look at all aspects in a study, and as with almost every site, the evidence could possibly still be interpreted wrong. Therefore, anthropologists will look to modern societies, believed to be close to the society in question, look at how things are done now, how items similar to those found in the archaeological sites are used now, and then hypothesize about how things were done in the past. This is truly an artform that not everyone can master, but it is very possible!

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Skin-to-skin care: The power of touch

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Abstract

Skin-to-skin care (SSC) is the prolonged holding of a diaper-clad neonate to the bare chest of the mother shortly after birth. It facilitates and strengthens the maternal-infant bond, in turn bettering the health and wellness of each. The therapeutic effects of SSC have been widely researched and discussed. Despite its popularity, however, new mothers may not know nor understand the nuances of SSC, thereby discontinuing its practice too soon to reap all available benefits. This paper features analyses of disparate studies illustrating the vast benefits that mothers and their neonates obtain from SSC. Searches were conducted utilizing the CINAHL Plus database of peer-reviewed articles using key terms ‘skin-to-skin care’, ‘preterm’, and ‘kangaroo care.’ The objective of this literature review is to promote earlier initiation of SSC and better maternal knowledge and understanding of short-term and long-term effects of SSC. Further, labor and delivery nurses will be able to provide their patients with pertinent knowledge to guide home skin-to-skin care. The analyses of the findings will contribute to a growing area of study and are aimed at improving the health of mothers and infants in the nation and bettering the nurse and patient education system in the healthcare environment.

Keywords: skin-to-skin care, kangaroo care, mothers, preterm, neonates, development

Introduction

Skin-to-skin care (SSC)¹ is a method of care that began in the 1970s. A shortage of incubators in Bogotá, Columbia necessitated the use of natural, maternal body heat to provide physiological stabilization and comfort to the newborns. Clinical trials were performed to assess the applications of SSC. The results of the studies indicated that SSC is both safe and did not have increased risks associated with the practice. By the early 1990s the success of SSC spread and news of its significance arrived in Europe and the United States where it later became a popular option of care (Feldman, 2004). Although holding a swaddled newborn infant is standard practice, SSC is unique in that it is prolonged holding. In addition, physical barriers such as clothing, are limited if not completely removed. The practice of SSC can ameliorate some of the postnatal complications that mothers and preterm infants face. Such complications include, but are not limited to, difficulty maintaining body temperature, difficulty breathing, difficulty feeding, and infections (World Health Organization, 2013). SSC has proven to be widely beneficial to both full-term (Feldman-Winter & Goldsmith, 2016; Phillips, 2013) and preterm infants. This literature review, however, reflects upon studies that analyze the short-term and long-term effects of SSC on the mother-preterm infant dyad. Special measures

should be taken when dealing with the delicate life of a preterm infant. The ways in which they are cared for during the immediate postpartum period will have an effect on their later development. There is a “sensitive” period after birth “during which close contact between the mother and infant may induce long-term positive effect on mother-infant interaction” (Bystrova et al., 2009). Although the research that Bystrova and colleagues performed assessed SSC of full-term infants, the existence of a “sensitive period” for preterm infants can be extrapolated because they are born early and underdeveloped and mothers may experience trauma as a result of the preterm birth (Muller-Nix et al., 2004).

It is thus important, if not imperative, that the medical community assist mothers with the provision of SSC as soon as possible after the birth in order to ensure that the dyad benefits from its physiological and psychological effects.

The Benefits of Skin-to-Skin Care

Researchers have studied the disparate effects of SSC on the mother, the infant, and the dyad relationship. Such effects range from physiological stabilization (Phillips, 2013) to decreased maternal postpartum depressive symptoms (Bigelow, Power, MacLellan-Peters, Alex & Claudette, 2012). SSC also assists mothers with breastfeeding, improves breastfeeding

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¹ For a list of terms and abbreviations please consult the glossary at the end of the article

outcomes (Hake-Brooks & Anderson, 2008), and is proven to alleviate pain that preterm neonates experience due to stressful standard procedures (Castral, Warnock, Leite, Haas, & Scochi, 2008; Lyngstad, Tandberg, Storm, Ekeberg, & Moen, 2014). However, there are barriers that may inhibit the immediate implementation of SSC or interrupt it, such as visitors to patient rooms and maternal perceptions of lack in privacy (Anderson et al., 2003; Ferrarello & Hatfield, 2014). A better understanding of SSC will lead to community championing of SSC standardization in the hospital as well as instill confidence in mothers to continue the practice at home.

Benefits to the Mother

Mothers face many disparate challenges during the journey of motherhood. Their experiences are affected by the presence of prenatal and postnatal complications that accompany preterm neonate birth (Muller-Nix et al., 2004) such as postpartum depression and stress. The mental and physical health of the mother, if poor, may cause devastating effects to the mother-neonate relationship, thereby hindering the development of the baby. In order to improve their quality of life, the care that is provided at the time of and after birth should be of the best quality. For both the mother and infant to thrive, both should be at the optimal level of health and wellbeing. The strength of one affects the strength of the other and the converse is also true. SSC is strongly correlated to improved health of the mother and her outlook on motherhood, especially because she is capable of caring for a being other than herself. It is intrinsically and extrinsically rewarding to the human being.

Breastfeeding

SSC allows mothers to easily breastfeed due to the proximity and position of the neonate (Feldman, 2004). Once comfortable with holding the neonate, breastfeeding is less of a challenge. Infant latch is instinctual preterm babies, however, may have some difficulties. It is the responsibility of the nurse to guide the mother to breastfeed the preterm infant. SSC can ease the difficulties and make breastfeeding a more enjoyable experience for the mother and the neonate. Further, oxytocin is a hormone that is released during breastfeeding via hand movement and suckling (Feldman, 2004). It is a hormone well-known to foster love and trust, positive feelings that facilitate the emotional bonding between mother and neonate. The presence of oxytocin during the postpartum period has been known to help return the uterus to its pre-pregnancy size and reduce uterine bleeding after birth. Oxytocin thus functions in a healing fashion, both physically and emotionally. It is only one aspect of breastfeeding's numerous benefits. In a study conducted

by Vittner et al. (2017), increase in oxytocin levels as a result of SSC improved parental and neonatal well-being. The neonates experienced decreased stress as indicated by decreased salivary cortisol levels and parents reported decreased anxiety (Vittner et al., 2017). SSC facilitates breastfeeding in the hospital, it also helps prolong breastfeeding long after the postpartum period of six weeks. A randomized controlled clinical trial that assessed the impact of kangaroo care (KC) on breastfeeding illustrates the importance of immediate SSC or KC (Hake-brooks & Anderson, 2008). Mothers that participated in providing SSC for unlimited amounts of time continued to breastfeed much more than those in the control group provided standard care, or those who held the neonates were wrapped in blankets, during the hospital stay. Nurses measured the amount and type of feeding on a three-tiered scale: mothers' own breastmilk, formula, or little to feeding, and researchers analyzed the recorded data. The nurse researchers were also responsible for educating the mothers; they helped the mothers with the breastfeeding processes initially and taught them how to recognize subtle infant cues and how to respond to the cues. When the researchers followed up with the mothers at 6 weeks and 3 months and then interviewed the mothers at 6, 12, and 18 months, they found that the KC dyads breastfed for about 5 months compared to 2 months for the control group. Mothers in the KC dyads also breastfed with more of their own milk and provided less of the mixed formula (Hake-Brooks & Anderson, 2008).

Improved mental health

Preterm birth causes a lot of stress for the mother. She may be concerned with the health of her neonate, especially if the outlook is grim. Preterm infants require immediate attention in order to address the complications that accompany their entrance into the outside world and this may lead to separation, hindering immediate SSC. Although SSC as soon as possible is desired, it is not always allowed, as the priority of healthcare providers is to ensure that the neonate is stable. This separation is both stressful for the neonate and the mother, who may feel extremely anxious and become depressed. A study of mothers with full-term infants revealed that SSC can appease the stress and decrease postpartum depressive symptoms (Bigelow et al., 2012). Mothers self-reported how they felt and their salivary cortisol levels were measured at 1 month postpartum. Researchers found that mothers who participated in the practice of SSC had lower levels of cortisol at the one-week and one-month visits when the samples were collected. Cortisol is a hormone that is released during times of stress (Bigelow et al., 2012). Studies of mothers and their preterm infants and the cortisol levels are not abundant, however, some longitudinal studies illustrate that SSC can improve how

the mother feels about her skills and understanding preterm infant cues. The comfort and fluency of the mother-infant interactions may indicate less distress and more eustress.

Benefits to Neonates

The premature neonate is fragile and highly impressionable. SSC improves the physiological stabilization and maturity of the neonate. The abundant care and attention they are given will better their childhood development, during a time that they may experience decreased motor and cognitive skills (Feldman, Eidelman, Sirota, & Weller, 2002). The health of the neonate affects the relationship that the infant has with the mother. Because preterm neonates may have difficulties with attention and focus, mothers have a difficult time interacting with the neonate. This causes disruptions in their relationships and may hinder the bonding. SSC can ameliorate the postnatal complications, and improve the physical and mental state of the neonate, thereby strengthening the dyad bond. It is of utmost importance to analyze the benefits in order to educate mothers about how they can proactively care for their neonates and further promote SSC in the home setting after the dyad is discharged from the hospital.

Physiological stabilization and development

As outlined earlier, SSC improves the mother's ability to breastfeed; the proximity allows her to learn her infant's cues and respond with fluency and ease. Not only does breastfeeding facilitate the mother, it is beneficial to the neonate as well. The mother is able to bond with her neonate and learn more about the beautiful human she has nurtured. When the neonate is held to the mother's bare chest, he or she is exposed to the microbes that are on the mother's skin. The microbes from the hospital, called nosocomial pathogens, will trigger the mother's immune system to develop antibodies against the pathogens, which can be harmful and illness-inducing. The antibodies that the mother's body builds are then transmitted to the neonate via breastmilk. This creates protection for the neonate and strengthens the immune system (Hake-Brooks & Anderson, 2008). Breastfeeding also has been shown to improve motor maturity. In a longitudinal study conducted by Ruth Feldman and Arthur Eidelman, infants that received large quantities of breastmilk "showed better neurobehavioral profiles...they were also more alert during social interactions, and their mothers provided more affectionate touch" (Feldman & Eidelman, 2003a).

Because preterm neonates may also experience dysbiosis, imbalanced gut function, they may have trouble with some bodily functions and experience discomfort. SSC assists with the maturation of the

microbiome in the preterm neonate. The microbiome is the host of microorganisms that are accumulated throughout life. Those that are acquired early in life, postnatally especially, will affect the health and development of the individual. Through samples of saliva taken from the neonates' mouths, the researchers concluded that preterm neonates that participated in SSC with their mothers had an abundant collection of microbes that resembled those of the older, healthier neonates (Hendricks-Muñoz et al., 2015).

Management of pain

Preterm infants are sensitive to stimuli such as bright lights, loud noise, and touch, frequently prevalent in neonatal intensive care units (NICUs). Their senses may be heightened and they may be more prone to feeling distress as a result. Measures have been designed to appease the anxiety and pain that standard procedures may elicit. Researchers have analyzed pain in preterm infants; one particular study measures the change in facial action (NFCS), behavioral state, crying, and heart rate, all of which have been linked to the expression of pain (Castral, Warnock, Leite, Haas, & Scochi, 2008). When mothers held their neonates for fifteen minutes before, during, and fifteen minutes after the standard heel prick procedure, researchers recorded the neonates' faces and analyzed the NFCS (brow bulge, eye squeeze, naso-labial furrow, open lips vertical mouth stretch, horizontal mouth, lip purse, taut tongue and chin quiver). They found that neonates held by their mothers and engaged in SSC had lower NFCS scores; i.e. they cried less during the procedure and had shorter cry duration during the recovery period. Compared to the neonates that did not have SSC with their mothers, those that did "appeared calmer and more organized during wound compression and recovery" (Castral et al., 2008).

Decreased stress and anxiety

In addition to the standard procedure of heel pricks, neonates experience many diaper changes during the duration of the hospital stay and later when they are discharged. The excessive stress that neonates experience during diaper changes may cause "long-term sequelae and sensitize the infant to pain and stress later in life" (Lyngstad, Tandberg, Storm, Ekeberg, & Moen, 2014). In their randomized crossover pilot study, Lyngstad et al. investigate if diaper changes cause stress in the preterm infant and if SSC can appease it (2014). The researchers analyzed changes in skin conductance and determined that diaper changes are indeed stress-inducing and the soothing touch of the mother does in fact decrease neonate stress. Although mothers did not engage in SSC, they were present for the diaper change and were able to touch the neonates' heads and bodies while speaking to them in soothing voices. The mothers in the control group were instructed not to touch the

infants and not to speak to them. The infants in close proximity to their mothers during the routine procedure had lower heart rates and respiratory rates, as well as less skin conductance, indicative of lowered stress levels. Because preterm infants may find diaper changes to be painful due to heightened algesia, sensitivity to pain, it is important to analyze how the mother's touch in this research facilitated the amelioration of stress. The neonate could not lie in the prone position on the mother's chest due to the space needed to perform the diaper change, thus, changes can be made to the method of SSC so that it is possible. One solution might be allowing the mother to change the diaper. Healthcare professionals will need to teach the mother, especially if the preterm neonate is her first child, however, this may increase her comfort with providing care measures and facilitate the transition from hospital to home care after the dyad is discharged.

Neonate self-regulation and maturation

Another complication that preterm infants face is difficulty in self-regulation of their physiological mechanisms, due primarily to their underdevelopment. One study illustrates the effects that SSC can have on the preterm neonate's autonomic and neurobehavioral health. Analysis of vagal tone, how respiration affects heart rate variability, determines the infant's ability to regulate the body in response to stress. In one study, 35 preterm infants received KC for a total of 29.76 hours over the course of 24.31 days (Feldman & Eidelman, 2003b). Infants that had KC with their mothers had "more rapid improvement in state organization in terms of longer periods of quiet sleep and alert wakefulness and shorter periods of active sleep (Feldman & Eidelman, 2003b). The findings of this study are valuable, because preterm infants typically exhibit less organized sleep-wake rhythmicity (Feldman & Eidelman, 2003b). Sleep is important to the physical health of the preterm infant, as it is a time of recovery and rest. In addition to aiding self-regulation in the preterm infant, SSC promotes arousal. The preterm infant may have difficulties responding to stimuli, or they may be too sensitive to them. In a study by Ruth Feldman, Aron Weller, Lea Sirota, and Arthur Eidelman, preterm infants from different hospitals were matched and compared (2002). The study was conducted in Israel, where KC is standard care in some hospitals; thus, randomization of the groups would not have been ethical. They found that at 3 months, "KC infants had higher thresholds to negative emotionality and more efficient arousal modulation while attending to increasingly complex stimuli" and at 6 months "longer duration of and shorter latencies to mother-infant shared attention and infant sustained exploration in a toy session were found for KC infants" (Feldman et al., 2002).

Benefits to the dyad

SSC benefits the mother and the preterm neonate individually. They bolster physical and mental health conditions. When each individual in the dyad is healthier and happier, the relationship between the two is less strained. The relationship, if strong, can further benefit the health of the mother and neonate; it is therefore important to analyze how SSC can benefit the dyad as a pair. Many of the long-term effects of SSC entail the development of the neonate and the mother-neonate relationship. The focus is primarily on the psychological and cognitive maturation as well as the interactions of the dyad and how SSC facilitates engagement and enrichment.

Maternal sensitivity

SSC provides moments of peace for the mother. She is able to look at, touch, talk to, and breastfeed her infant. The time that she spends with her infant will increase her sensitivity to infant cues and affect her competency of motherhood. The parent-child interaction is dependent upon the development of the neonate. The converse is also true. Thus, it is of great importance to review and discuss how SSC can play a role in bolstering both interactions and neonate cognitive and motor development. Another study by Ruth Feldman, Arthur Eidelman, Lea Sirota, and Aron Weller analyze the impact that KC has on mother-child interactions. The researchers found that after KC, the interactions between the mother and child were more positive at 37 weeks gestation. The mothers "showed more positive affect, touch, and adaption to infant cues" while the infants displayed higher levels of attention, alertness, and less gaze aversion (Feldman, Eidelman, Sirota, & Weller, 2002). Feldman et al. hypothesize that the improved interactions were a result of better parental mood, perceptions, and interactive behavior. Their home visits entailed studies of their interactions, namely maternal sensitivity by analyses of "acknowledgement of infant's interactive signals, elaboration of the child's vocalizations and movements, warm and positive affect, affectionate tone of voice..." (Feldman et al., 2002). These factors, and others, were witnessed more in the dyads that experienced KC during the immediate postpartum period and continued it after the hospital stay.

Improved interactions

Families that experience KC engage in reciprocal interactions and engage in affectionate touch, more so than families that do not participate in KC. Families participated in a training program that educated them on the importance of SSC (Feldman, Weller, Sirota, & Eidelman, 2003). Those that engaged in SSC during the postpartum period were more likely to touch their preterm infant during play at three months. The infants

“showed less negative affect” and the family style was more cohesive.” In addition, the infant was placed in closer proximity during play, thereby improving and increasing mutual gaze and touch when the mother, father, and infant played together (Feldman et al., 2003).

Development throughout childhood

Finally, a study that followed preterm infants across their first ten years of life reveal that KC infants have improved physiologic organization and mother-child reciprocity (Feldman, Rosenthal, & Eidelman, 2014). The research highlights the importance of early intervention and the ability of improved care in the hospital to benefit the dyad in the long run. KC was implemented for two consecutive weeks, an hour per day, and preterm infants were then visited and studied seven different times over the first decade of their life. The researchers visited them and analyzed their physiological and cognitive health and measured the mental health of the parent and the relationship between mother and child. They assessed sleep organization, stress reactivity, cognitive development via standardized tests, and much more. At term age, KC infants had more organized sleep cycles and mothers reported lower anxiety; however, at ten years, a difference between KC mothers and control mothers was not found. This may illustrate the ability of preterm infants to later match infants of further development in life; whether this is due to the SSC intervention or not remains unknown. It is, however, hypothesized that SSC facilitates speedy maturation. Furthermore, following the KC intervention, the mothers provided “more attachment behavior across the postpartum period and showed greater mother-child reciprocity at ten years” (Feldman et al., 2014). The primary, pertinent findings of this research include “an attenuated stress response, more mature autonomic functioning, organized sleep, better cognitive control...” (Feldman et al., 2014). This research is the first to illustrate the power of prolonged postnatal touch and care having an impact long after the postpartum period. It further proves that interventions during the early stages can better the health state of preterm infants and their mothers, underlining the importance of studying SSC and promoting its implementation into standard hospital practice.

Barriers to Skin-to-Skin Care

Despite the significance of the findings in the aforementioned studies and the fact that they are only a few of the many that discuss the benefits of SSC, barriers to skin-to-skin care remain present in the hospital setting. Hindrances prevent the immediate implementation of SSC and may interrupt it. A few

studies and surveys have been conducted to gauge the opinions of the mothers and the nurses caring for them.

A survey of fourteen mothers and fifteen nurses in a mixed methods research study revealed that there are many hindrances preventing immediate SSC postpartum. Although the study included mothers of healthy, full-term infants, it can be hypothesized that the reported barriers may be similar to those that preterm mothers experience. Preterm mothers may experience the barriers on a different scale, i.e. their anxiety may be heightened and they may be in varying states of stress; it is important to discuss this study in order to better gauge necessary actions in order to overcome the barriers. Mothers reported others wanting to hold the baby, safety concerns in relation to grogginess and fatigue, visitors in the room, and pain from Cesarean sections. The nurses caring for them noted that visitors in the room, the mothers’ grogginess, mothers’ concerns about modesty, mothers’ unawareness of SSC’s benefits, and others wanting to hold the baby were barriers (Ferrarello & Hatfield, 2014).

Skin-to-skin contact should continue in the home setting as well. It is equally important to implement SSC in the hospital as it is in the domestic environment. Although other stressors and responsibilities in the home may exist, it is vital that the mother continues to practice what she has learned from the nurses during her stay, because of the existing and further researched benefits to both the mother and neonate.

Research conducted by Blomqvist, Frölund, Rubertsson, and Nyqvist (2012) illustrates the perceived barriers by parents in the NICU. The researchers found that a majority of the parents they studied continued the provision of KC to some extent once they were discharged from the hospital; they wanted to assess the reasons for continuation or lack thereof. Blomqvist et al. found that parental understanding of the benefits of kangaroo care motivated them to be persistent about its practice. However, at home, there were many distractors that limited the time that mothers could spend providing KC and SSC. Further, many of the parents would practice SSC when they felt that it was comfortable, but not frequently throughout the day. This study, amongst others, emphasizes the importance of the NICU environment and its staff in influencing parents, mothers especially, to continue SSC in the home. One major finding in this study is as follows: support from the other parent, support from the staff members, the time and opportunity to be with the infant a majority of their stay, and the privacy that the NICU staff allowed improved parental willingness to participate in SSC and continue it after discharged from the hospital (Blomqvist et al., 2012). Further research is needed to assess how well nurses are educating their parents and providing the optimal environment for SSC in order to improve outcomes of mother-neonate SSC in the home

and elsewhere after being educated in the hospital setting. Potential solutions to overcome the barriers mentioned in the aforementioned studies include improving nursing practice and communication between hospital staff and patients.

Significance and Implications

Critical analyses of SSC is imperative to better understanding the improvements that should be made to hospital policies. Mothers, when educated about the benefits of SSC, are more likely to participate in active touch and care of their preterm infant. When doing so, they are able to reap the benefits of improved self-image, improved mental health, a strengthened bond and healthy perception of their neonate, and more. The detrimental effects of entering the world too early are ameliorated with skin-to-skin care and neonates are able to self-stabilize their physiological states and have improved developmental outcomes as they grow. The medical community should guide mothers and their families to provide an environment that promotes and facilitates the provision of SSC in order to improve the health and development of the preterm infant. Further research is needed to assess the optimal amount of time that the dyad contributes to sharing skin-to-skin contact. In addition, more studies that analyze the function of SSC to facilitate mother-neonate attachment should be conducted. Research thus far has indicated that the benefits of SSC far outweigh the risks. Thus, continuing to assess hospital policies and nursing education about SSC is pertinent and valuable to the field of healthcare and understanding of life.

Glossary of abbreviations and key terms

Dyad: a pair of individuals in an interactive, significant relationship

Full-term: infants born at 37 weeks gestation or later

KC: Kangaroo care; used interchangeably with SSC; primarily used to describe care for preterm infants

Neonate: newborn infants less than one month old

Preterm: infants born before 37 weeks gestation

Premature: infants born before 37 weeks gestation and lacking full organ development

SSC: Skin-to-skin care; mother holds naked or diaper-clad infant to her bare chest for prolonged period of time

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Why are there fewer men in the maternal-newborn field of nursing?: A review

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Abstract

It is commonly known that gender categorizes people in some way, by placing people into certain roles or stereotypes. Because of these stereotypes of masculine vs. feminine, men in nursing encounter many obstacles, especially if they desire to go into maternal-newborn nursing. Nursing in general has been associated with women, because of the claim that women are nurturing and caring by nature. As a result, there are only 11% of men in nursing in the United States, and limited research on the experience of men in nursing in the maternal-newborn field, as most articles consist of anecdotal evidence. An overview of the difficulties men in nursing face when pursuing the maternal-newborn field, a comparison to male midwives and obstetricians, and implications for policy, education, and the public media are discussed.

Keywords: gender bias, men in nursing, male nurse, maternal-newborn nursing

Introduction

Men often face barriers and stereotypes when pursuing nursing (Cude, 2004). Because being a nurse has been historically associated with females, males have become a minority in the profession (Cude, 2004). In the United States for the last 5 years, the population of male nurses has steadily remained at 11% (Auerbach, Buerhaus, Staiger, & Skinner, 2017). Although there are great efforts from research and advertisement in male nurse recruitment, there is one unit in nursing where there are fewer men—the maternal-newborn field (Biletchi, 2013). A field that mostly has female patients, a cultural history of men's place in the delivery room, and the duty of a nurse to be nurturing and caring, these traits not commonly thought of with men (Cude, 2004). A Google search of male OB-GYN, or male labor and delivery nurse brings up suggested related searches of “male gynecologist creepy,” “horror stories,” or “gender bias in nursing.” We do not see this trend when addressing “female” doctors (Rajacich, Kane, Williston, & Cameron, 2013). These views are reflected in the data as fewer than 1% of the existing numbers of male nurses are in obstetrics. However, 45% of obstetricians are male, although their number is also declining (Association of American Medical Colleges, 2015; Karlamangla, 2018). The purpose of this literature review is to analyze current research on male nurses in the maternal newborn field, and their recommendations.

A problem deeply rooted in culture and history

In 1970, the number of female gynecologists was 7%, and now it is 59% (Karlamangla, 2018). According to the LA Times, this decline in “male OB-GYNs could eventually lead to them being excluded from the specialty” (Karlamangla, 2018, para. 7). The discourse of men in the maternal-newborn field has created the “ultimate collision of medicine and gender politics” (Karlamangla, 2018, para. 10). For example, an OB-GYN resident, Dr. Jerome Chelliah states he's been blantly rejected numerous times, from patients that state, “I'd rather see a female doctor,” or post a sign in their room that says “female providers only” (Karlamangla, 2018, para. 2, para.14). It is common for male OB-GYN residents to be asked to be outside the exam room, whereas female OB-GYN residents are able to assist in delivering babies. The experiences that male residents are facing in this field have led to a decline in men pursuing this specialty. Only 17% of residents in obstetrics are male. This is a problem because “diversity improves the quality of care” (Karlamangla, 2018, para. 22). Different perspectives may aid in solving a complex problem, and lead to future advances in the field. Another doctor pointed out this disparity, “if you exclude 50% of people from anything, think about how much you've lost, you might lose the next person who's going to find a cure for cancer” (Karlamangla, 2018, para. 23).

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This issue is also visible in nursing. Nursing originated when men took care of the sick in hospitals back in the sixth century of the Roman Empire. Whittock & Leonard (2003) report nursing emerged as a female profession in the nineteenth century by Florence Nightingale, because women were “nurturing and caring by nature” (as cited in Cude, 2004, p. 344). The ability to express feelings and care is seen as a “female privilege” (Grady, Stewardson & Hall, 2008 as cited in Kouta & Katie, 2011). The public and the profession view men as gay or feminine for being a nurse, and although this view is changing, men are still excluded from gender-specific units - mostly from their female coworkers (Whittock & Leonard, 2003 as cited in Cude, 2004). Across many cultures, it was found that “men in nursing are stereotyped and treated differently on the job and there are reports that male nurses are perceived as deviant, odd, med school failures, or homosexual” (Clow, Ricciardelli, & Bartfay, 2014, p. 366). Additionally, men in nursing are challenged when caring for female patients because they are not prepared for it through their education, even though male and female nursing students have the same requirements for nursing school (Cude, 2004; Kouta & Katie, 2011). Some male nursing students tried to avoid the postpartum rotation by asking for additional time in newborn nursery or labor and delivery because they felt more accepted there (Patterson & Morin, 2002 as cited in Cude, 2004). Other male nursing students were in awkward situations, and faced rejection from patients and their nurses (Cude, 2004). A study from 1995 - 2005 in Ireland reported limitations and varying requirements for male nursing students in obstetrics is one of the barriers to nursing (Keogh & O’Lynn, 2007 as cited in Kouta & Katie, 2011). Lastly, in several studies it was found that female patients have stress when male nurses “physically or intimately touch their genital area and breast” (Inoue, Chapman & Wynaden, 2006 as cited in Kouta & Katie, 2011, p. 60).

There was a history of legal issues in a man’s right to work in the maternal newborn field. In two court cases, it was ruled “that female gender is a legitimate qualification for labor and delivery nurses, while the Equal Employment Opportunity Commission has determined these qualifications to be discriminatory” (Boughn, 1994 as cited in Cude, 2004, p. 344). Arguments supporting men in the maternal newborn field claim “there is no logic in the fact that obstetricians are traditionally male and yet a strong bias often exists against male obstetric nurses” (McRae, 2003 as cited in Cude, 2004, p. 344). Furthermore, if female nurses are taught to act professionally when providing care for male patients, male nurses can do the same without violating a female patient’s privacy and dignity (Brown, 1986 as cited in Cude, 2004). To this day patients still reserve the right to refuse care by a male nurse, but

“most of the time, patients seem to be open and nondiscriminatory toward men” (Cude & Winfrey, 2007 as cited in Kouta & Katie, 2011, p. 60). It is argued that gender discrimination should be thought of as an ethical issue like discrimination based on race or ethnicity (O’Lynn, 2003 as cited in Cude, 2004).

Other doctors have an opposing view for men in obstetrics. There was a struggle for women in the 1970s to get in to medical school, and there is “some residual sexism in that view, that we need men to be sure that we’re training the best possible people for our specialty,” (Karlman, 2018, para. 31). Women only dominate the gynecology and obstetric field, but men lead in 37 other specialties. Women are often mistaken as nurses when they wear scrubs, but this mistake does not often occur to men (Karlman, 2018).

Some believe the decline in male OB-GYNs is due to patients searching for doctors that they can relate to (Karlman, 2018). For example, one patient stated “even a female gynecologist has been to a gynecologist” (Karlman, 2018, para. 38). Another patient stated she felt like her male OB-GYN could not understand her pain during labor. Women have the shared pain of the menstrual cycle. Some men agree with this view, they don’t want to continue the “history of men telling women what to do with their bodies” (Karlman, 2018, para. 41). They feel that they are not able to empathize with pregnant patients, and their experience is capped because men do not have a uterus (Karlman, 2018).

8% of patients prefer male OB-GYNs, 41% of patients in the same study have no gender preference (Karlman, 2018). Male nursing students found that hospital staff expressed more concern about their gender than the patients (Cude, 2004). The focus on gender does not include transgender patients, or gender nonconforming patients that do not relate to male or female (Karlman, 2018). The ability of a health care provider should be focused on the ability to communicate and have empathy, rather than gender (Karlman, 2018).

Current research in the maternal-newborn field of nursing

Because of the limited research with men in the maternal-newborn field of nursing, the following section describes the use of touch, legal issues men face in women’s health, intimate procedures, and the anecdotal experiences of men in maternal-newborn field.

The use of touch

Touch is a key component of nursing, especially in personal care in maternal nursing, but it becomes potentially problematic because of its link with gender and social rules (Biletchi, 2013; Zhang & Liu, 2016). Moreover, the use of touch by men is may be seen as a

pathway for sexual abuse (Zhang & Liu, 2016). This is exacerbated by the gender stereotype that men are unable to be caring and feeling - and that touching or feeling is natural activity for women (Zhang & Liu, 2016). This also leaves men in vulnerable conditions. In this decade, there is a low-touch trend, but the “process, timing, or context in which the type of touch should be employed in contemporary nursing should be described” (Zhang & Liu, 2016, p. 325). A study surveying 111 male nurses revealed that 49% of them did not receive guidance on appropriate touch by their nursing faculty (O’Lynn, 2007 as cited in Zhang & Liu, 2016). Nursing education has focused on “female stereotypes and roles such that male nurses should behave like women to be proficient nurses” (Inoue et al., 2006 as cited in Zhang & Liu, 2016, p. 325).

Legal issues

In the court case of Moyhing v. Barts and London NHS Trust in 2006, a nursing student in the Bachelor of Science program, Moyhing claimed he was excluded from participating and observing intimate procedures, whereas female students were not. He made the claim that male nurses were like second quality citizens (U.K. Employment Appeal Tribunal, 2006 as cited in Kouta & Katie, 2011). This claim was supported by the Equal Opportunities Committee of London. There were three instances in which Moyhing was treated different from female students. The first was with an Asian female patient who required an ECG. This was considered an intimate procedure because it involved the patient’s chest. He was required to have a female chaperone with him, but female nurses do not need to be accompanied. He felt as if he was a criminal, and not trusted enough to complete his duty. A second instance was when he was not allowed to perform catheterization on a female patient, but female students can catheterize male patients. The last case was when he was asked to leave the room for a Papanicolaou smear was performed. These cases are problematic because it raises several questions, “... was the student accompanied by the chaperone because he needed a chaperone or because of the stereotypes against male nurses?” and in the second circumstance, was he not allowed to perform catheterization “in an effort to respect the woman’s privacy? If this was the case, why is the same procedure not being followed by the female nurses as well” (Kouta & Katie, 2011, p. 61). The policy can be categorized as sexist and a human rights violation because of its inability to provide equal educational opportunities for nursing students based on gender (Kouta & Katie, 2011).

Male nurse experiences in maternal-newborn nursing

Biletchi (2013) asserts male maternal-newborn nurses comprise 0.18% of the nursing population in Canada. In his experience, he was not prepared for the

unusual remarks from coworkers and patients about his ability to care. He believes a nurse’s qualifications should not be based upon gender, biology, or experience in life. Male nurses are seldom questioned about their ability to care for a patient with myocardial infarction, or surgery. Biletchi (2013) contends maternal male nurses in difficult situations to utilize open communication, think before responding, and not allow stereotypes to define their competence as a nurse, and seek win-win situations.

Other research findings have continued to support the notion that male nurses are excluded from labor and delivery and postpartum areas, or are not assigned in that area, “even though male doctors are welcome” (Clow et al., 2014, p. 365). Some male nurses experienced being pushed towards workloads analogous to their gender role, such as administrative roles or heavy lifting (Clow et al., 2014). A male midwife expressed his mentor said to a female patient in labor, “I’m working with a student, he’s a man - is that OK? You don’t have to have him if you don’t want,” (Pendleton, 2015). This made the patient feel that it was an unusual situation for a male midwife student to be there. Pendleton (2015) adds in this situation he had to work hard to overcome the patient’s initial negative perception of him, which female midwife students did not have to go through.

Brown (1986) discusses his experience in labor and delivery - his experiences, although decades ago are relevant to situations of male nurses today. He describes when working as an obstetrical nurse, he found his patients to be concerned about the quality of care they receive rather than his gender. But if a female patient were uncomfortable, he would offer getting her a female nurse instead. He rarely experienced patients changing their nurse based on gender. He received support by new mothers in labor and delivery, because he helped reinforce their husband’s capacity to provide support, as well as boost their confidence. Brown (1986) argues, “surveying patients about how they might feel about a male labor and delivery nurse isn’t enough,” it is important to “check with hospitals that employ them” (p. 62). Lastly, he supports the claim that in order for nurses to meet the objective of quality patient care, competent nurses are needed. Gender should not be a crucial factor in deciding employment in all areas of nursing, especially labor and delivery (Brown, 1986).

The importance of diversity and inclusion

Despite the controversy and debate about men in nursing and in the maternal newborn field, researchers have promoted inclusion of men in these fields. One reason is to “increase the recruitment and retention of men in the field” (Mortimer, 2008, O’Lynn 2004, and Sherrod, Sherrod, & Rasch, 2006 as cited in Clow et al., 2014, p. 366). It was found that job satisfaction and

retention have a clear relationship (Mrayyan, 2005 as cited in Rajacich et al., 2013). Job satisfaction of new graduate male nurses is only 67%, compared to 75% for new female nurses (Sochalski, 2002 as cited in Rajacich et al., 2013). The lower job satisfaction of male nurses may result in low retention rates. Another study found that only 40% of male nurses felt comfortable revealing their job as a nurse (Bernard Hodes Group 2005 as cited in Rajacich et al., 2013). Other supporting claims are to create a nursing workforce that reflects the culture and gender diversity of its population, and men in nursing may help solve imminent nursing shortages (Clow et al., 2014).

Implications

The following section describes recommendations for policy, education, and public media.

Policy improvements

Recommendations to counteract the barrier of gender in clinical settings is to have gender issues included in all nondiscrimination policies in an institution, and have all employees understand that the policy forbids discrimination against men, and increase the access of “male nurse role models in the classroom and clinical settings” (Keogh & O’Lynn, 2007 as cited in Kouta & Katie, 2011, p. 61). If a male nurse encounters gender discrimination by staff, the disciplinary action for the staff member should be similar to those that racially discriminate (Kouta & Katie, 2011).

Education improvements

Male and female nursing students should have equal instruction on how to handle intimate procedures (Kouta & Katie, 2011). For example, it is recommended that using humor and “giving a full-detailed guidance for intimate procedures to women clients could help both male nurses and female clients to overcome their stress related to the procedure” (Inoue et al., 2006 as cited in Kouta & Katie, 2011, p. 62). Another way to handle intimate procedures is for nursing faculty to outline the appropriate uses of touch to male nurses, and include “the use of communication, awareness of cultural differences and beliefs, and use of confident touch” (O’Lynn, 2007 as cited in Zhang & Liu, 2016, p. 325). Lastly, Biletchi (2013) recommends incorporating “communication techniques for men dealing with gender bias and fears of rejection into nursing, or therapeutic communication coursework and lectures” (p. 53).

To further impede gender discrimination in nursing students, peer support should be developed in nursing schools (Kouta & Katie, 2011). This can be achieved by creating an accepting environment for differences in

students, having supportive coworkers, and the allowing for male nurses to reflect on their experiences in intimate care (Kouta & Katie, 2011; Biletchi, 2015). Faculty can furthermore assist in facilitating the change. They may include in the curriculum stereotype origins and effects on nursing practice, provide counselors as an avenue for students to discuss problems, and have male nurses available for male nursing students because they can relate to their issues (Jinks & Bradley, 2003, and Brady & Sherrod, 2003 as cited in Kouta & Katie, 2011). There is also a push for nursing associations to remove the “she” bias when referring to nurse practices and code of ethics. Faculty can remove the she bias in their curriculum as well (Weber, 2008 as cited in Kouta & Katie, 2011). It is crucial for faculty to pay attention to their own bias towards male nursing students in the maternal-newborn rotation, and evaluate their teaching strategies and course material for distinct gender messages (Biletchi, 2013).

Improvements in public media

The media can highlight male nurse role models, reduce the emphasis on nursing being a feminine profession, include photos of male nurses in labor and delivery, and promote gender neutral terms in nursing articles and textbooks (Zhang & Liu, 2016). Nursing schools may participate by advertising their school nursing program with male and female nurses, with male nurses shown in the maternal-newborn area (Biletchi, 2013). They may also have a male nurse present at a nursing school open house to encourage future students to join (Biletchi, 2013).

Conclusion

The dilemma that men in nursing, as well as male obstetricians and midwives face when pursuing the maternal-newborn field is alarming. With a looming shortage of nurses in the United States, it is imperative to promote recruitment and retention of men in nursing (Rosseter, 2017). Additionally, men in nursing increase the diversity of the workforce and contribute different perspectives to solving problems in health care (Karlmanangla, 2018). If men are excluded from nursing and the maternal-newborn field, there is lost potential for growth and advancement in the healthcare field (Karlmanangla, 2018).

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Healthcare reform: Issues with insurance

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Abstract

Healthcare is essential for a thriving and healthy society, yet even in affluent societies such as the United States healthcare disparities persist. The government compensates for these disparities by enacting healthcare reform. This is especially important in California's Central Valley where communities face a shortage of medical professionals and there is high dependency on publicly funded healthcare coverage. In 2010 the United States government enacted the Patient Protection and Affordable Care Act (PPACA/ACA). Perhaps the most impactful and controversial component of the law was the health insurance mandate, the aim of which was to insure all individuals, providing access to healthcare and covering the cost of healthcare. This review explores whether having health insurance ensures access to healthcare services. Furthermore, this paper covers US and California healthcare reform and its implementation to examine how it has shaped the healthcare system and the health insurance industry.

Keywords: Healthcare, Healthcare Reform, Patient Protection and Affordable Care Act (PPACA)/ Affordable Care Act (ACA), individual-mandate, healthcare provider (HP), patient (PT), insurance carrier (IC)

Introduction

Advances in the medical sciences have contributed to the increase in overall health and wellness of many individuals, and accessible healthcare is vital for the health and advancement of society. These advances in healthcare are one of the reasons healthcare costs rise, limiting the access people have to healthcare services (1). Effective and accessible healthcare is essential for individuals and society to thrive, yet many still suffer from a number of illnesses that are either preventable or treatable. In response the government has enacted reforms to the healthcare system and affiliated industries, such as health insurance industry. When trying evaluating healthcare reform it is important to understand the intent and the successful or unintended consequences of these reforms. The goal of healthcare reform, particularly the Patient Protection and Affordable Care Act (ACA), is to increase the number of insured individuals, provide access to affordable care, and to improve the quality of that care they receive in hopes of improving healthcare outcomes and the general health of society (2,3).

The first of the goals listed above, to increase the number of insured individuals, is the most significant portion of the ACA. This objective is otherwise known as the individual-mandate. Although it is a topic of much political debate, this review will not cover the arena of political dialog and mainstream media. The inquiry of this review is whether or not health insurance

gives individuals access to needed healthcare services. To this end this review will primarily discuss the issues found in the health insurance industry and how healthcare reform, especially the individual-mandate, has addressed or transformed these issues.

This review begins by highlighting the milestones of healthcare reform in the United States and California with an emphasis on the ACA and the California version of this bill, California Patient Protection and Affordable Care Act. Then changes to healthcare and health insurance costs/prices in recent years are revised to observe what they entail for healthcare consumers. This is followed by an assessment of the roles and relationships of the patient (PT), healthcare provider (HP) and insurance carrier(IC). To conclude we discuss the problems that persist and the plans or steps that are being made to resolve them.

Brief history

During the late 19th and early 20th century European countries began to adopt measures to provide for healthcare services for the public (4,5). In the US the rise of the progressive movement gave rise to demands for health insurance and "sickness funds" (4,5). In 1915 the American Association of Labor Legislation (AALL) proposed a bill that would have provided coverage to the working class but it failed to pass (6). At the time healthcare in the US was funded and regulated by municipalities, professional organizations such as the

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American Medical Association (AMA) and private insurance companies (7). The call for nationalized healthcare became associated with the unpopular politics of Socialism, which led to an increased influence of private insurance companies (7).

In 1935, FDR's new deal ushered an era of reform that included some considerations for healthcare, yet FDR and his administration anticipated there would not be enough support so it was removed from further consideration (4,5). However, in 1935 the US government did enact the Social Security Act which later provided the means for the passage of the first major healthcare reform (4). **Figure 1** shows the amount of healthcare and health insurance related laws adopted by the US since the beginning of the 20th century (8,9). **Figure 1** does not include the additional policies and regulations created by government agencies to implement the legislation passed by Congress. As seen the number of healthcare related laws increase after the Social Security Act.

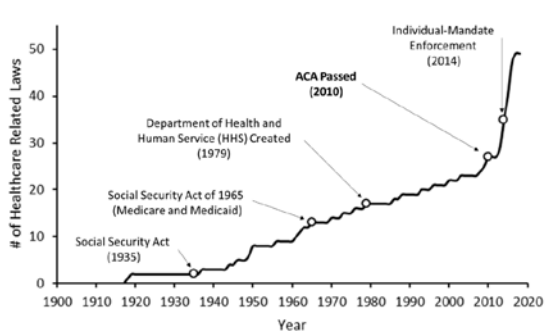


Figure 1. The number of Healthcare related laws and amendments enacted by the Federal government.(7,8)

The first major success in healthcare reform occurred in 1965 when Congress passed the Social Security Act of 1965 that created Medicare and Medicaid (10). This law finally created programs that provided people access to medical care by covering the associated costs. This law empowers the government to finance healthcare programs, such as Medicare and Medicaid, which in turn pay for medical expenses of qualifying individuals and families. People who are eligible to receive coverage through government programs are those who qualify for social security benefits or those with low income (11,12). The state of California has MediCal, the California version of Medicaid whose eligibility criteria are similar to Medicare and Medicaid (13,14). As a result of the creation of Medicare, Medicaid and its State specific programs, the percentage of uninsured dropped a remarkable 10% from just under a quarter of the population to just below 15% (**Figure 2**) (15). Ten percent of the population in 1965 translates to nearly 20 million people (16). The number of uninsured even

dropped to about 11% in the early seventies and again in the early eighties (15).

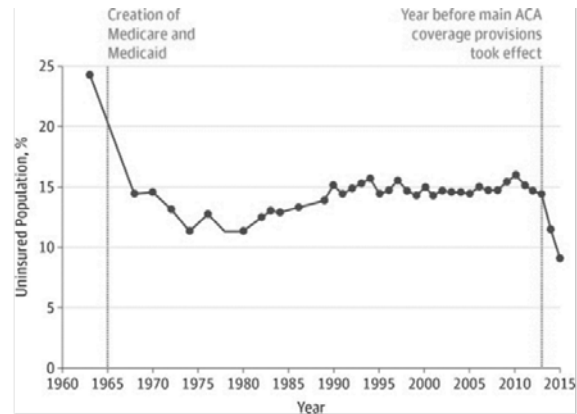


Figure 2. The number of uninsured individuals in the US from 1916 to 2015 (12)

Previously, people were also denied medical care because they were not able to afford the cost of the services (4). The Emergency Medical Treatment and Labor Act (EMTALA), passed in 1986, prohibits healthcare providers from denying emergency care based on a patient's inability to pay (17). This was a major change to the prior practice of turning away patients who could not afford to pay or had the wrong insurance, even those in critical condition (17). However, this did not address as to how cost of service was to be paid.

Patients' rights were further advanced by The Health Insurance Portability and Accountability Act (HIPAA) enacted in 1996 (18). HIPAA set up regulations and practices intended to protect the rights and privacy of patients (18,19,20). This policy holds medical professionals and healthcare plans accountable for the sensitive and confidential information of their patients (19). Moreover, HIPAA decluttered a complicated and fraudulent system, introducing regulations of the health insurance industry (18).

In 2010, the United States government enacted the landmark Patient Protection and Affordable Care Act (PPACA), more commonly referred to as the Affordable Care Act (ACA) (21). Like previous reforms this law also planned to make up for many of the disparities in healthcare. **Figure 1** also shows that following the enactment of the ACA there was a surge in healthcare and health insurance legislation. Unlike previous reforms the ACA was very ambitious in that it included a universal individual-mandate for healthcare insurance which went into effect January 1, 2014 (2,3,21,22). By law every individual is required to have a health insurance to cover medical expenses, most people could face fines and penalties for not complying (21,22). Following the implementation of the individual-mandate the number of uninsured individuals in the US dropped to historic lows (**Figure 2**) (15). The percent of

uninsured hovered at about 15% of the total population for over two decades (1989-2013) and by 2015 the percentage lowered to about 9% of the US population. In 2014 this six percent drop in uninsured meant there were 30 million newly insured people (23). The ACA also made provisions for persons with preexisting conditions, prohibiting insurance companies from denying them enrollment (21). This is another factor contributing to the increase of insured people.

The state of California also passed AB 1602, the California Patient Protection and Affordable Care Act (24). The ACA also lists a number of changes including the expansion of MediCal eligibility, which resulted in increased MediCal membership. In addition, it created the state's health insurance market place known as Covered California (25). About 33.4% of Californians or covered by Medical (26) with an estimated 13.4 million people enrolled in the program in 2016 (27). This number is up from the previous estimates of 8.6 million or 22.4% of Californians in 2013 (27). Just as across the entire US the population of uninsured dropped in California, in this case from 17.2 % in 2012 to 7.1% in 2016 (28).

Prior to healthcare reform in the US the healthcare system was managed purely by professional organizations and private insurance companies. These and other healthcare reforms strengthened the influence of the government working for the public interest. Health insurance is now available to more people without which many would not afford the cost of healthcare. The most significant attempt at increasing the number insured persons is undoubtedly the individual-mandate of the ACA. In 2017 an estimated 28.9 million people remain uninsured (29). These people including some that are insured are not receiving the medical care they need (29,30).

Premiums and medical costs

Ensuring that the US citizenry was insured was done in order to achieve another objective laid out by the ACA, to increase access to affordable and quality healthcare (2). Theoretically, increasing insurance membership would reduce the price of insurance and what member pay out of pocket for their medical services. **Table 1** shows how the price of healthcare in the US has changed since the implementation of the individual mandate. Due to inflation there is an expected gradual increase of premium prices and per

Table 1. Average price for individual health insurance premiums, percent increase in price, rate of inflation, and per capita healthcare spending in US from 2014 to 2017. (31, 32, 33, 34, 35, 36, 37)

Year	Average Premium Prices (USD)	% Increase	Inflation Rate	Per Capita Spending (USD)
2014	\$6,025.00	2.39 %	1.80 %	\$8,045.00
2015	\$6,251.00	4.75 %	1.75 %	\$9,594.00
2016	\$6,435.00	2.94 %	2.20 %	\$10,348.00
2017	\$6,690.00	3.96 %	1.85 %	-

capita spending in healthcare costs in the US. Although the increases seem modest, premium prices are increasing at a higher rate than US inflation (37).

The values in **Table 1** are useful but as averages we do not see the extreme situations that entire states have faced. Arizona had eight insurance providers in 2013 but by 2017 most counties only had one insurer providing medical coverage (38). Insurance providers left due to poor estimation of costs and enrollment which resulted in heavy losses (38). This was further aggravated when the government compensations for losses were lower than promised (38). Health insurance premiums increased by an average of 51% in 2017 from 2016 (38). Georgia faces a similar dilemma, only one insurance provider covers the entire state and its estimated that premiums there will increase 40.1% on average in 2018 (39). California rates are also increasing but at a much milder rate with estimates showing an average increase of 12.5% in 2018 (39,28). California's health insurance market place has eleven insurance providers enrolling members for 2018 which are said to breaking even or making modest profits, both are said to suggest stability in the California insurance market (28).

Most low-income individuals and families are eligible for government financed medical coverage such as Medicare, Medicaid or MediCal. These programs offer coverage that requires little to no out-of-pocket costs for the patients (28). Those who do not qualify for these programs enroll through their state's health insurance market place, in California it is called Covered California (39, 28). **Table 2** shows the out-of-pocket costs that individuals will be paying for medical services in 2018 in California. The different coverage levels correspond to the amount people pay for their health plans. Bronze has the lowest premiums and

Table 2. Out-of-pocket costs for medical services under the different coverage levels offered by Covered California in 2018 (28).

Medical Service	Coverage Level			
	Bronze	Silver	Gold	Platinum
Annual Exam	\$0	\$0	\$0	\$0
Primary Care	\$75	\$35	\$25	\$15
Specialty Care	\$105	\$75	\$55	\$30
Urgent Care	\$75	\$35	\$25	\$15
Emergency Room	Full cost	\$350	\$325	\$150
Deductible	\$6,300	\$2,500	-	-

platinum with the highest (28). There is an additional fifth level of minimum coverage plan for those in desperate situations (28).

Some lower income families may not qualify for the federal or state assistant programs like MediCal (28). To address this the US and California governments subsidize individuals and families that make up to 138% of the federal poverty threshold with cost sharing (28,40). Yet those with lower incomes would still be inclined to opt for the lower priced health plans to cover

other expenses or simply they could not afford to pay the higher premiums. This leaves these potential patients in situation where they may disregard needed medical care to avoid paying high co-pays or because of an inability to do so. Even the prices for primary care and prescription medications have high co-pays for lower level health plans (28).

The role of the patient, provider and insurance carrier

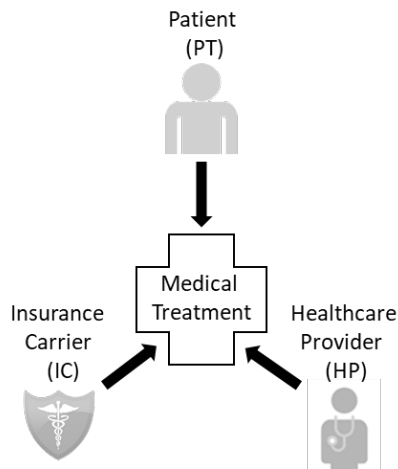


Figure 3. Diagram of the three parties that determine the medical treatment a patient receives.

Figure 3 Shows the parties involved in the decision-making process for a patient’s medical treatment. This all three play a role in the treatment and care decision-making process. This section will explore what role and influence of each of these stakeholders.

Patients

A patient’s preference has only recently gained more influence in deciding the treatment they would like to receive (41). Healthcare consumers, patients, also have the ability to hold healthcare providers accountable via the Consumer Assessment of Healthcare Providers and Systems (CAHPS) (42). Through CAHPS patients express concerns and report inadequacies in the healthcare they received. Healthcare providers and Systems need to address patient concerns to improve their services and meet their patient’s needs. Patients have many factors, such as their income level, culture, family, and the ability or inability to pay, influencing their preferences and whether or not they receive a particular treatment (30,43, 44). Some patients feel unqualified to provide input to decisions in their healthcare because they are unfamiliar with medical treatments and procedures, especially for patients with chronic or severe conditions (45,46). Patients are now

becoming more informed consumers which can help them and their providers more confident moving forward with a plan of care (47). The patient population is very diverse and each new patient displays a unique set of values that must be respected (48).

Healthcare providers

Healthcare providers and systems have an evidence-based practice paradigm as well as education and training in pathology which determine the way they provide services to healthcare consumers. Providers following this evidence-based practice model and their judgement to make clinical decisions (49). Healthcare providers formerly played a greater role in deciding the treatment a patient would receive, sometimes going against the will of the patient (50). Contemporary medical ethics dictate the patient has autonomy in choosing their treatment (41,48). A patient’s choices would only be limited by their insurance provider.

Therefore, the current role of medical professionals is to inform patients about their medical deficiencies, if any, and provide them with the options they have to meet those needs (50). Once the patient makes their choice the healthcare professionals carry out what the patient’s preferred treatment option. Previously, the decisions in healthcare were more intimate, discussed privately between patients and their healthcare providers, but the introduction of insurance carriers of health plans introduced a third party in decision making (50).

Insurance carriers

The kind of healthcare plan an individual has may affect patient access to different healthcare providers and healthcare systems (1,7, 28). The role of insurance carriers is to cover their members’ medical costs but they too partake in deciding a patient’s treatment. Insurance carriers have also taken an active patient advocate role, protecting their members from malpractice (51).

In the US there are two major agencies that function as public healthcare plans Medicare and Medicaid (11,12). Medicare is changing the way it compensates healthcare providers. Medicare is moving from the previous “fee-for-service” model which compensated providers for the amount of care given, to the “pay-for-performance” model, which compensates providers based on the process, outcome, patient experience, and structure (51). Providers are required to meet these standards in order to improve the quality of care. Typically, private health insurance companies follow Medicare’s “Golden-Standard” which means this will soon apply to many if not all health insurance policies (51). Following this model also protects the financial interest of health plans. By ensuring that their members

receive quality care reduces the probability that members will need more care.

Issues with insurance

The PPACA addressed many of issues patients and providers had with insurance carriers (**Table 3**) (52). It was common occurrence for health insurance carriers to deny coverage to patients with preexisting conditions,

Table 3. New patient rights and protections under PPACA (52).

Health Insurance Rights and Protections
<ul style="list-style-type: none">• Those with preexisting conditions cannot be denied coverage• Illegal to be dropped because of new illness• Choice of doctor• Free preventative care• Ends lifetime and annual dollar limits

drop coverage for those with newly developed diseases, or deny approval for medical care that exceeded financial limits (4,7,50). These practices were utilized by the insurance to maintain their business profitable.

With the PPACA it is illegal to use such methods and leave patients on their own, but insurance companies can and have chosen to close operations in unprofitable regions leaving only one insurance carrier for those entire region (1, 28). The PPACA also holds insurance carriers accountable for increased prices in premiums (52). In places where only one insurer remains this company manages the costs of an entire region and has practically monopolized that region. In such situations, with individuals and businesses having no alternative, the insurer can easily justify increasing premiums.

Public insurers do not have the option to close operations if there are financial challenges but governments cut funding for the programs and impose reductions in spending, as was the case with MediCal (53). Public insurance, including Medical, provides coverage through partnerships formed with private health plans (54). Medical covers one-third of all Californians, yet despite having health insurance MediCal enrollees have issues receiving the care they need (27). Primarily, there is general shortage of medical professionals making it difficult to meet the medical needs of Californians. Moreover, physician participation in MediCal did not correspond to the growth of MediCal members (27). In fact, both primary care and specialty care physicians were more likely to service patients with a private insurance carrier (27). In 2016 a state funded medical school decided to drop a MediCal managed health plan, leaving thousands of patients without care (55). Physicians and healthcare systems cite complicated approval processes and insufficient reimbursement for discontinuing contracts with MediCal (27,55). MediCal members lack the resources they need to receive their needed medical service in proper and timely manner.

The majority of the issues that remain in the healthcare and health insurance industry emerge from the insurance business model. The insurance business model is meant to reduce the financial impact of risk. This model is effective for emergency medical situations but falls short in providing finances for continued services. For the model to work most members of a health plan would not receive medical services with only a small number of members receiving temporary treatment. In 2017 the US government repealed the individual-mandate of the PPACA effectively eliminating the fines and penalties for those without insurance (56). Beginning January 1, 2019, the individual-mandate will no longer be enforced and it is estimated that millions of people will no longer enroll for health insurance (56). This will only further destabilize the health insurance industry that remains somewhat unsteady (28,39).

Conclusion and implications

United States healthcare reform was aimed at overcoming the challenges its citizens face in receiving the quality healthcare needed for a thriving healthy society. The individual-mandate of the PPACA decreased the number of uninsured and gave patients more rights and protections. So far, there remain many problems to overcome to achieve the goal of providing affordable, accessible, and quality healthcare. Moving forward proponents of affordable and accessible healthcare are working towards a single payer system in the US (57). The single payer system is not socialized medicine or a universal healthcare system in which the government owns the entire healthcare system, rather, as the name suggests, the government would be the sole payer for healthcare services leaving the system in private hands (57). This system would cover every individual, essentially eliminating the need for health insurance and the individual-mandate. The single payer system will resolve some, if not all, the challenges that patients continue to face in receiving care, but there may arise a new set of challenges.

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New perspectives on defeating multidrug resistant pathogens

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Abstract

Understanding the spread of antibiotic resistant pathogens in hospitals is of vital importance. As time goes on more and more microorganisms are becoming drug resistant and it is becoming increasingly important to find a method to control this process. In this research, I will be studying the microorganisms closely and evaluating multidrug resistance in bacteria to find out if there is a particular mechanism all the bacteria use to become resistant. For the mechanism, I will be focusing on the chromosomal mechanism of the bacteria, in particular, the gram-negative bacteria. The two bacteria that I will be focusing on will be *Methicillin-resistant S. aureus (MRSA)* and *Mycobacterium tuberculosis*. If I am able to find a particular mechanism or pattern that all the bacteria use then it can become easier to find a drug that targets that and would lead to the prevention of microorganisms' immunity. Even if a specific common mechanism is not found, looking at the two bacteria more closely can bring new information in light that can help future research.

Keywords: Multi-drug resistant pathogens, antibiotics, disease

Introduction

According to Austin (2001) understanding the spread of antibiotic resistant pathogens in hospitals is vital. As the time goes on more and more microorganisms are becoming drug resistant and it is becoming increasingly important to find a method to control that. Having said that, it is important to note that this article was written more than 10 years ago and still a way to control microorganisms has not been found, showing, even more, need to find a way to keep the microorganisms from becoming immune to all the drugs. In this research, I will be studying the microorganisms closely and evaluating the multidrug resistance in bacteria to find out if there is particular mechanism all the bacteria use to become resistant. For the mechanism, I will be focusing on the chromosomal mechanism of the bacteria, in particular, the gram-negative bacteria.

The two bacteria that I will be focusing on will be *Mycobacterium tuberculosis* and *Methicillin-resistant S. aureus (MRSA)* and. If I am able to find a particular mechanism or pattern that all the bacteria use then it can become easier to find a drug that targets that and would lead to the prevention of microorganisms immunity. Along with that keeping in mind that even if a particular mechanism is not find in common looking at the two bacteria more closely can bring new information in light that can help future research.

Background

Bacteria are prokaryotes, meaning they are unicellular, lack organelles, and do not have a nucleus such as those found in human eukaryote cells. Another distinct feature that separates the bacteria from other prokaryotes is that their cell walls are made of peptidoglycan which is a polymer made of layers of sugars and amino acids. The human cells not only lack the peptidoglycan but the human cell does not have a cell wall making it easier to make medicine that attacks that peptidoglycan in the cell wall which would not damage the human cells. The only problem is that there are two types of bacteria: gram-positive or gram-negative. Gram-positive bacteria are those that have a thick layer of peptidoglycan in the cell wall, while the gram-negative bacteria are those that do not have the thick layer of peptidoglycan cell wall. Peptidoglycan is mostly found in the cell walls of the gram-positive and gram-negative bacteria which has a polymer that is made of the polysaccharide chains and the peptide chains. This makes it not only harder to treat the infections of gram-negative bacteria's but also means that, when treated with medication, the human cells are also affected. Still, there are medications that exist to treat them.

Not all bacteria are bad bacteria; actually, there are more good bacteria than bad. The other bacteria that we can refer to as the good bacteria are part of our normal microbiota and also include probiotics. Bacteria that are part of the normal microbiota reside in or on a body and

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normally do no harm to us; rather, they are there as an acquisition. Some of the places where the bacteria that are normal microbiota reside include the nose, throat, eyes, mouth, skin, large intestine, urinary and reproductive systems. Probiotics, on the other hand, are live microbes that are ingested into a body to exert a beneficial effect and some things that are ingested with probiotics include things like yogurt. Out of all the bacteria species, only 100 bacteria species cause disease (Tortora et. al. 2016).

Some of the diseases gram-negative bacteria cause include things like bloodstream infections, pneumonia, and more. In most cases, the microorganisms are resistant to multiple drugs. According to the Centers for Disease Control and Prevention, the gram-negative bacteria are becoming gradually resistant to most available antibiotics and are finding even more ways of becoming resistant. Along with that, they are passing on the genetic information for the resistance, making other bacteria resistant.

In the medical field, antibiotic resistance is slowly becoming a large problem. According to, "What is Antibiotic Resistance and Why is it a problem?", the infections that are now emerging are becoming an independent epidemic in the hospitals and the bacteria are becoming a primary source of resistance and continuing to spread the epidemic. The medicine is not able to help because of resistance to it. Antibiotic therapy revolutionized healthcare and the effectiveness of these antibiotics is now limited because the bacteria are slowly becoming resistant to them (Kaufman & Kaufman 2011).

A bacterium becoming resistant to a single antibiotic is not the biggest problem; the issue is that microorganisms, such as those that cause tuberculosis, are becoming multi-drug resistant. The article by Dye explores the ways in which there are new standards in place to treat multidrug-resistant tuberculosis. Some of the cures include short-course chemotherapy to control TB, while other are mostly testing for improved resistance and more on second-line drugs (Dye et. al. 2002).

In a recent article Nikaido emphasizes the harm caused by antibiotics given to animals because this use can lead to multidrug resistance. This shows that the multidrug resistance is a problem not only in humans but also in animals and it will only increase unless something is done about it. Nikaido identifies two mechanisms that play a role in multidrug resistance: 1. the accumulation of multiple genes within a single cell that occurs in the R plasmid and 2. the increased expression of genes that code for multidrug efflux pump. This mechanism then includes a large range of drugs (Nikaido 2009). Multidrug efflux pump, according to JM Blair, is able to transport antibiotics out of the bacterial cell and that would mean that the bacterial cell

will not be harmed. When the expression increases it means that there will be more bacterial cells that can pump out the antibiotics.

Rationale

In this research, I plan to work with bacteria that are multidrug resistant. By doing this, I want to determine whether or not all bacteria have the same mechanism that leads to resistance. If I find the mechanisms to be the same then that information can lead us to better understand how to stop the rising problem of bacteria becoming resistant to drugs. For this, I will be focusing on the chromosomal mechanism. Along with that, I want to know if genetics plays a role. For example, is the same site of the chromosome affected by the mutations that occur or is do some mutations happen randomly on any chromosome at any location. Do multiple random genes play a role in the mutation or is it similar genes that always change?

Methods

I am going to work with two different types of bacteria that are multidrug resistant, compare their chromosomal mechanisms, and use that to figure out if it is possible that all the bacteria use the same mechanism. In order to start, I will choose two bacteria that are resistant to same drugs and follow that by library research to find out if a mechanism for the resistance of the organism has been noted and then compare the mechanisms of both. By comparing the two mechanisms I will be able to find if there is any particular point that the mechanism is similar and if that can be targeted.

Discussion

The two multidrug resistant bacteria that I will be studying are *Methicillin-resistant S. aureus (MRSA)* and *Mycobacterium tuberculosis*. MRSA is usually seen in epidemic when the infection spreads and the bacteria keep on multiplying. According to Chambers, MRSA is something that is spreading worldwide even among healthy people and its resistance to multiple antibiotics make it extremely difficult or impossible to treat. In, "Sequencing Staph: New Genetic Analysis Tracks MRSA Mutations", the DNA sequence of the MRSA strand was coded completely from samples from different continents of the world. One thing that was easily identified is that MRSA is not something that is transmitted internationally but rather has a limited range of transmission and multiple independent mutations. According to Harmon, in "Sequencing Staph: New Genetic Analysis Tracks MRSA Mutations", by looking that the genetic changes it was determined that the rate

of substitution is faster than originally deduced; the rate is now deduced to be one core base pair every six weeks which is 1,000 times the rate for *Escherichia coli*. It was found that on various lines of strain the mutation of resistance appeared on many occasions according to Harmon showing that about 29% of the mutations in MRSA are directly related to the evolution of antibiotic drugs that are used which goes to show that the evolution of that pathogen has a major driver with clinical practice.

Mycobacterium tuberculosis is another multi drug resistant bacterium. It is one of those bacteria that is not multi-drug resistant, but any new strand of it is formed making it even harder to treat and people who may have been treated previously are getting it again. Through the articles that I read about *Mycobacterium tuberculosis* I was not able to find the sequencing of the strands similarly to MRSA. According to Nguyen, *Mycobacterium tuberculosis* has reached a profound resistance level already compared to all the others and it is composed of both passive and specialized mechanisms, but the way that these mechanisms evolved to the antibiotics is unknown. Something that is not only preventing the use of current antibiotics, but also preventing the new drug development, is the resistance and tolerance mechanisms. Over the time it is observed that there is an upward trend in the emergence of resistance. Internationally approved regimens and chemotherapy use are the two things together that appear to show some positive results for the treatment, but other than that not much is said about the *Mycobacterium tuberculosis* mechanism or mutation occurrence over time.

Significance and conclusion

I expect my work will show that there are multiple factors that play a role in a bacteria becoming multidrug resistant, but there is a common mechanism that they all follow.

This will provide a new direction that then can be used to further the study of multidrug resistance. The information can then be used to make drugs or other treatments that can be used. The medicine would then be targeted at that particular chromosomal mechanism. Along with that, if a particular mechanism is not effective, it can still bring new information to light that can help future research.

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An inquiry into the effects of smartphone use on reading comprehension

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Abstract

There are many positive aspects to the growing popularity of smartphones. Increased access to interpersonal communications, increased safety capabilities, and access to the World Wide Web are just a few of the positive aspects that the burgeoning technology brings to society. As with most things, there are also negative aspects to the persistent technology. The bulk of research on the topic of smartphones has revolved around distraction, reaction times, and overall safety in regards to automotive usage. This report attempts to consolidate some of the pertinent information regarding smartphone use and its impact on reading comprehension. Studies have shown that high reading comprehension levels are an indicator of academic success. Four key aspects of reading comprehension, repetition, organization skills, cognitive skills, and metacognitive skills, are all greatly affected by the types of distraction caused by smartphone usage. Included are analyses of recent studies that show that simply having a smartphone nearby may cause a 10% reduction in working memory ability. Data regarding smartphone usage trends, user attitudes and perceptions, distraction, reduction of cognitive abilities, and task switching strongly imply that smartphone use is responsible for a significant negative impact on reading comprehension. There are several opportunities for future research into the topic. Specifically, the need for intrasubject research may better measure the effect of smartphone usage at the individual level. Both long-term and short-term studies can better provide information to consumers and students about the possible negative effects of smartphone usage.

Keywords: reading, technology, smart phones

Introduction

Smartphone technology has forever changed the way humans communicate with one another. The smartphone has made it faster and more convenient to access the World Wide Web, friends and colleagues from around the globe, and interact with social media. Without a doubt, smartphone use has solved some societal problems. Conversely, smartphone use may have created many some problems to solve in their place. With respect to literacy, what are the effects of smartphone use on students? There is a need for better understanding of the impacts of smartphones use on reading comprehension.

Strong reading comprehension skills are one of the most important tools to aid the success of a student. The ability to read and comprehend a variety of textual elements is a fundamental foundation on which most educational institutions build. In early studies, researchers have found that skilled silent reading skills were a key factor in academic success in college. Broom and Porter (1934) declared thatxrf “results of the two quantitative evaluations of the contribution of silent reading to college academic effects emphasize the

importance of reading as a study tool.” A more recent study, conducted in part due to a “preliminary finding that low NET reading comprehension scores were associated with higher rates of attrition” in specific nursing programs (Symes, Tart, & Travis, 2005). Within the study, Symes, Tart, and Travis discovered that “reading comprehension score was almost twice the correlation of graduation with the math score, admission GPA, and science GPA” (2005). Due to the proliferation of smartphone use, there is a need for further research on the effects of the technology on reading comprehension.

Current trends in education are showing that institutions are abandoning their fight to keep social media use from intruding into the classroom and are instead embracing its use as an educational tool. Educators are now attempting to integrate the use of Twitter, YouTube, and Facebook into their lesson plans (McMeans, 2016, Poore, 2013). While there are several benefits to using a multimedia approach to learning, such as the ability to incorporate audio and video aids, increased communication abilities, and the ability of the internet to expand on learning concepts, without careful

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implementation, social media as an educational tool can be more distractive than effective (Poore, 2013).

There is data that suggests that, when given the chance, most students would prefer access to their smartphone during class (Grinols & Rajesh, 2014). Many of the students underestimated their own ability to focus on their academic tasks effectively while in the classroom with many smartphones in use (Grinols & Rajesh, 2014). As social media and smartphones become a larger part of the learning process, it would be beneficial to fully understand the level of impairment that multitasking or task switching that this technology is having on students.

While reading is a universal skill, the type of text being read may change the specific techniques that a reader may employ. Various types of text such as science, mathematics, history, literature, and philosophy each require their own suitable reading speed, repetition of reading of passages, and knowledge of vocabulary to properly comprehend. Four key subsets of skills are useful in forming proper study habits. Repetition, or rehearsal, of information, both in absorption via reading and in expression via notetaking or vocal expression, aids in the storage of information in long-term memory for later recall. Organizational-based study skills allow students to set aside adequate time, in a proper environment, to reduce the number and intensity of distractions from studying. Cognitive study skills allow the new information to become associated with existing information already stored in long-term memory. Finally, metacognitive skills allow the student to apply the information in the correct time and place (Gettinger & Seibert, 2002). Unfortunately, smartphone use has the ability to interfere with all four subgroups of study skills.

There is alarming data that suggest that most college students do not recognize smartphone use as reading (Nadelson et al., 2013). A majority of participants did not consider text messaging, social media and gaming as reading activities (Nadelson et al., 2013). With students oblivious to the fact that they are reading while using a smartphone, the habits of multitasking and task switching will proliferate.

Mokhtari, Reichard and Gardner (2009) demonstrated that college students are spending a large percentage of their time using the internet. Participants reported spending an average of 2.47 hours per day using the internet, 2.17 hours per day engaged in academic reading, and just 1.14 hours per day engaged in recreational reading (Mokhtari, et al., 2009). The study also found that 85% of participants classified using the internet as an enjoyable experience (Mokhtari, et al., 2009). As smartphones provide mobile and

immediate access to the internet, the opportunity for students to choose the internet over academic reading is present at all times.

Unfortunately, the Mokhtari, Reichard, and Gardner (2009) study did not take into account the effects of multitasking or task switching.¹ The negative effects of task switching are discussed by Rogers, Monsell, and Hunt (1995). Participants who engaged in task switching needed time to readjust the mental control setting that dictated the rules for completing the task as well as dealing with the effects of errors caused by attempting a new task while still using outdated mental rule sets. Two of the largest negative effects of task switching are an increase in overall time to complete all tasks and an increase in errors (Weinschenk 2012).

David and colleagues (2015) discovered that college students who multitask prefer to utilize music, text messaging, and social media. Of those surveyed the participants who self-reported high levels of addictiveness to their smartphone also reported a high amount of multitasking while engaging in academic reading (David et al., 2015). The trend of smartphone use in an academic setting is implied in a study of pharmaceutical students' use of social media in the classroom (Weiler, et al., 2015). Participants reported spending an average 8.46 minutes of a typical 50-minute class on a social media platform (Weiler, et al., 2015). The same study showed that 47% of participants agreed or strongly agreed that social media is a distraction while studying at school (Weiler, et al., 2015). The percentage of participants increased to 56.3% when agreeing or strongly agreeing that social media is a distraction while studying at home. While Weiler and colleagues focused on social media rather than the platform of smartphones, social media access is a key feature of smartphones.

Working memory has been shown to be a key component of reading comprehension. As we read items, the information from the reading is placed into working memory until it can be properly stored into long term memory for recall (McVay, Kane, & Gauthier 2012). Distraction, while information is in working memory is a key cause for improper long term storage. McVay, Kane, and Gauthier (2012) establish a strong link between working memory, attention control and reading comprehension. Interruption experiments using various methods have been consistent in showing that reading comprehension is negatively impacted. The types of interruption have includes mathematical problems, unrelated text passaged, and pressing a key on a keyboard (Foroughi, Werner, Barragán, Boehm-Davis,

¹ Multitasking is defined as performing two or more tasks simultaneously while task switching is defined as the immediate switching of one task to another. It is believed that true multitasking

does not exist. When an individual is multitasking they are essentially performing task switching at a very rapid pace.

& Gauthier, 2015). Rehearsal, the act of mentally reviewing and refreshing information, is an important aid in memory retention. Decay, the act of time passing, has a negative effect on memory. Interruption too plays a key role on causing impairment on the ability to recall information (Farrell et al., 2016). While both factors, decay and interruption, can cause a participant to forget information, the active use of a distractive element, such as a smartphone, may have a greater impact than simply decay.

Other outside studies also highlight the negative effect of just having a smartphone nearby when trying to study. Ward, Duke, Gneezy, and Bos (2017) show compelling evidence that cognitive abilities suffered and attention spans decreased in participants that kept their smartphones within the same room as the cognitive and memory measurements. Participants who had their phone in their pocket or bag had an approximately 8% decrease in working memory capacity while those who had their phone on the desk and visible had a 10% decrease in the same metric. (Ward, Duke, Gneezy, & Bos, 2017). A similar study, involving text message interruptions while viewing a video lecture confirmed that participants who received text messages during the lecture scored lower, by a full letter grade, than those who did not receive messages (Lee, Kim, McDonough, Mendoza, & Kim, 2017). Due to the conditions of this experiment, participants who did not have access to their phone, while scoring higher in academic metrics, reported higher levels of anxiety than those who had their phones.

Smartphones have clearly established themselves as regular tools in the daily lives of many. The impact of smartphone activities is difficult to quantify. Does smartphone use immediately after reading cause a significant amount of distraction to affect the ability to recall key details and themes from the reading? Does the use of a smartphone affect everyone in a similar manner? Do all levels of reader suffer the same effects of loss of literacy skills due to smartphones? Is it possible for individuals to task switch from reading to smartphone use without a loss of literacy skills?

While distraction and task-switching experiments have been shown to reduce reading comprehension abilities and smartphone usage is often a distractive element that utilizes task switching, there is little direct research into the relationship between reading comprehension and smartphone use. Ideally, better understanding of the topic may come from intrasubject studies. These types of studies could better record the type of change that smartphone use has on an individual's reading comprehension ability. As smartphone use increases, both inside of and outside of

the classroom, a better understanding of the effects of smartphone use reading comprehension is necessary.

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The effects of environmental color in higher education classrooms

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Abstract

This article explores the relationship between academic performance of college students and the color of their classrooms. Specifically, this research seeks to study the color of classroom walls at Stanislaus State and if it has a positive, negative, or neutral effect on student test scores and the amount of time required for students to finish those tests. In a testing environment in which participants were given three variants of a math test, the walls were covered with fabric wallpaper, altering the color of the room. After completion of the tests, the participants' test scores and the time required for completion of the tests were recorded. The participants were also given a questionnaire to gauge their own reactions to the changes made to the walls. In this scenario, the results of the test and the time are the dependent variables, and the color of the walls are the independent variables. The colors chosen for the walls were a blue, red, and beige, all similar in shade and value. These colors were chosen because the beige matches the current color of the classroom walls at Stanislaus State and is the control, while red is known to be exciting, and blue is known to be calming. The expected results for this study were that the red environment would show negative results and the blue environment would show positive results when compared to the beige scores and times. Specifically, researchers expected lower scores and longer times versus higher scores and shorter times. The result from this limited pilot study show that while the colors of the walls might not have had a noticeable effect on the student's test scores, the wall colors influenced the students' focus and mental states. Many felt that the red room was distracting, uncomfortable; the beige room was unremarkable; and the blue room was calming and comforting. The goal of this study is to discover if there is a relationship between classroom wall color and student performance in the hopes of increasing the efficiency of classrooms and supporting and advancing student learning.

Keywords: Art, color, student learning, classroom environment

Introduction

Color is everywhere. Unless a person has a type of blindness, color is unavoidable in the world. It has the power to affect our moods and decisions, which is why it plays a very significant role in advertising. Color is so important, yet most people do not even realize the effect color has on their everyday lives especially on their emotions. Red is known to be an exciting color that excites the body (both positively and negatively), and blue has been associated with calm and serenity (Kaya & Epps, 2004). Color in the advertising world, is never random. Historically, before color manipulation became common practice in advertising, designers questioned whether the extra expense for color was worth it. Now, advertisers strive to employ the most effective use of color to make an impression on consumers. However, consideration must also be given to which colors for what products, how they affect the consumers, and how those colors interact with each other (Birren, 1956). Some say that choosing a color for a brand is more about uniqueness and what is available than emotional association. (Smith, 2015) However, it cannot be denied that people will make color associations on their own. Thus, marketers must

still take color associations into consideration. In education, and especially in early development, images and color environments fully surround children. When in classrooms and when reading books, information is passed along using images and colors to make everything clear to the children. But as children age and their comprehension increases, the attention to color and images decreases, and the academic environments of students become sparser.

A study by Stone (2001) sought to discover if the color of a study environment affected the students' performance. The resulting analysis focused on how the colors red, blue, and white affected students' studying experience on math and reading. Stone sat students at desks with colored partitions and had them take either a math or reading test, then observed the students' mood, satisfaction, motivations, and performance. The study indicated that while negative mood was affected by the study tasks, positive mood was more affected by the color environment of the study areas.

A similar study by Johnson and Maki (2009) Investigated if the color on classroom walls might have an effect on student learning and behavior. One room was painted with three walls beige, and the

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complimentary wall blue-gray in the front of the room. A control room was painted all white. One hundred students were placed in both classrooms, and they were studied for on task-behavior, academic performance, and sense of well-being. The results determined that the white control room revealed a significant decrease in student test scores compared to the painted room. Additionally, the off-task behavior exhibited in the colored test room decreased after being painted, as did the student's anxiety.

A study by Dwyer and Moore (2002) sought to find out if color-coded versus black and white images in an informational packet would affect students' results on an exam. Their study on 56 male students concluded that there was little difference in test results (Dwyer & Moore, 2002). Those same researchers also did a similar study previously with female students. However, in that study, it appeared that the women who received the color-coded informational packet scored significantly higher on their retention test (Dwyer & Moore, 2001).

The importance of this study is that it focuses on the classrooms of advanced higher learning on college campuses. In this investigators observation, student classrooms go through a negative evolution as the students age. In kindergarten, the classrooms are bright and colorful, with visual simulations covering it seems every surface. However, as the students advance and move on to higher and higher education levels, the classrooms begin to lose their color and shift more towards the stale monotony of government buildings. This research is dedicated to discovering if there is a correlation between the color of classroom walls and student learning. While similar studies have been done in that past, I believe that this study will illuminate the significance of color and its effects.

Method

For this experiment, what is needed is three large sheets of fabric, large enough to cover the participants field of vision and three variants of a simple test. For this experiment, the researchers used a two by two-digit multiplication test of 30 questions, a questionnaire given after the tests to gauge the participants' reactions to the changes in the environment, and a stopwatch to record the time it took the participants to complete the tests.

After participants were found through SONA and through in-person requests for participation, they were instructed to arrive at a testing room in the Innovative Center at Stanislaus State. The participants were then given a consent form to sign. Once they read the form and signed it, the participants received instructions to sit at the supplied desk where they took the tests. Set up in front of the desk on the wall, the fabric was

pinned in layers to wall in random drawn order for each participant. Once seated, the participants were given instructions to complete the tests in front of them and to work through at whatever pace is comfortable for them. The researcher recorded the time it took each participant to complete each test. Between each test, the researcher removed a layer of the fabric, changing the color of the wall, and repeated the process again. Once the participants completed the tests, they were given the questionnaire. After everything was done, the researcher recorded and filed the participants' test scores, time, and questionnaire result for later analysis.

Results

The expected results for this study are the following. The scores, times and questionnaire responses will be compared between the three of them; specifically, beige versus red and beige versus blue. When compared, the researchers expected to find that the red results are negative compared to the beige, and the blue results are positive compared to the beige. Red would produce low test scores and slower times while blue would produce higher test scores and shorter test times.

There were 12 participants in this study, two of which opted out of finishing the study after the first test and one of which did not finish the first test. Because of the limited number of participants, more research would need to be done to gain statistically significant results. The analysis considered the results in three different categories: by trial, by test, and by color of the wall. Overall, it appears that there was little correlation between the walls and the test scores.

Results by trial

For the first trial (Table 1), participants averaged a test score of 23.83 out of 30 points possible and an average time of 11:51 minutes. For the second trial, participants averaged a test score of 23.1 and an average time of 9:40 minutes. For the third trial, participants averaged a test score of 24.7 and an average time of 9:03. Considering the results by trial is problematic. As participants got used to doing the math problems, their times got progressively better. However, their test scores did not get progressively better. The moderate score was achieved in the first trial, the low score in the second, and the best score in the third trial. The colors equally balanced in the first round. Of the participants who made it to the second round, the beige color appeared 4 times, and the red and blue three times each. The beige color could have accounted for the lower score. In the third trial, the blue color appeared five times out of 10. This could have accounted for the highest score of the trial,

suggesting that color might have an impact on the student test performance.

Results by test

For this consideration, I looked at the average test scores per test, their times, and the colors that were paired with that test (Table 2). The first test had an average score of 24.18 and an average time of 11:20 minutes. Test two had an average score of 24.8 and an average time of 10:18 minutes. The third test had an average score of 22.72 and an average time of 9:23 minutes. Based on scores, test three appears to have been the hardest test, but it also had the fastest time. However, the beige color appeared five times out of eleven. This might suggest that the beige color might allow for faster times, but poorer scores. Test two had the highest score, with the moderate time. However, the blue color appeared five times out of ten. This suggests that the blue might allow students to achieve higher scores, at a more moderate time. The first test had the moderate score, but the slowest time, perhaps suggesting that red is too distracting for the participants to think clearly.

Results by color

By color (Table 3), the blue test had an average score of 22.91 and an average time of 10:36 minutes. The beige had an average score of 24.3 and an average time of 10:43 minutes. The red had an average score of 24.6 and an average time of 9:26 minutes. The red had the highest score of the three colors, and the fastest time. Blue had the moderate time and the lowest score. When looking at the results based on the color, the results seem to disagree with the proposed hypothesis, with the red performing the best and blue performing the worst.

Questionnaire results

The questionnaire was used to ask the participants questions about their experience of the study, and to hear their opinions of the different colors and what it was like to take a test in the different environment. When asked how the participants felt in the beige environment, the majority of participants said that the color was boring and/or that they felt nothing in

particular while in that environment. When asked how they felt in the blue environment, majority said they felt calm and focused, and that that's where they felt they performed best. When asked how they felt in the red environment, the majority of the participants said they felt distracted and uncomfortable while in that environment.

Discussion

The goal of this experiment is to discover if there is a relationship between classrooms and student performance. After looking at the results of this limited study, it is hard to tell if there is any clear correlation between the color of the walls and student test scores. However, when looking at the questionnaire, it is clear that the color of the walls has an emotional effect of the students. The hope is that the results will be indicative enough of this relationship to continue the research on a larger scale with the goal of eventually creating more efficient classrooms. The current beige color of the CSU Stanislaus classrooms is at the least boring, and at the worst, dampening the mental prowess of students.

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Table 1: Results by Trial

Part. #	Trial 1 color	Trial 1 Test #	Trial 1 Time	Trial 1 Score	T2 - C	T2 - #	T2 - T	T2 - S	T3 - C	T3 - #	T3 - T	T3 - S
1	B	2	19:47	28	Y	3	17:21	26	R	1	16:01	24
2	R	3	6:39	27	B	2	5:55	29	Y	1	5:46	26
3	Y	1	13:34	0	R	2	5:35	0	B	3	5:15	0
4	R	1	11:40	27	Y	2	12:11	27	B	3	11:00	26
5	Y	2	10:35	26	R	3	8:27	23	B	1	8:26	25
6	Y	3	10:37	28	B	2	10:48	23	R	1	9:58	27
7	B	2	6:24	26	Y	3	6:27	25	R	1	5:59	30
8	B	3	8:29	11								
9	R	2	15:21	29	B	1	14:41	23	Y	3	13:41	29
10	B	1	21:57	24								
11	Y	2	6:21	30	R	3	5:46	29	B	1	5:20	30
12	R	1	10:58	30	Y	3	9:37	26	B	2	9:10	30
Avg.			11:51	23.83333333			9:40	23.1			9:03	24.7

Table 2: Results by Test

Part. #	Test 1-Score	Test 1-Time	Test 1-Color	T2 - S	T2 - T	T2 - C	T3 - S	T3 - T	T3 - C
1	24	16:01	R	28	19:47	B	26	17:21	Y
2	26	5:56	Y	29	5:55	B	27	6:39	R
3	0	13:34	Y	0	5:35	R	0	5:15	B
4	27	11:40	R	27	13:11	Y	26	11:00	B
5	25	8:36	B	26	10:35	Y	23	8:27	R
6	27	9:58	R	23	10:48	B	28	10:37	Y
7	30	5:59	R	26	6:24	B	25	6:27	Y
8							11	8:29	B
9	23	14:41	B	29	15:21	R	29	13:41	Y
10	24	21:57	B						
11	30	5:20	B	30	6:21	Y	29	5:46	R
12	30	10:58	R	30	9:10	B	26	9:37	Y
Avg.	24.18181818	11:20		24.8	10:18		22.72727273	9:23	

Table 3: Results by Color

Part. #	Blue Test #	Blue Time	Blue Score	Y #	Y T	Y S	R #	R T	R S
1	2	19:47	28	3	17:21	26	1	16:01	24
2	2	5:55	29	1	5:46	26	3	6:39	27
3	3	5:15	0	1	13:34	0	2	5:35	0
4	3	11:00	26	2	13:11	27	1	11:40	27
5	1	8:36	25	2	10:35	26	3	6:27	23
6	2	10:48	23	3	10:37	28	1	9:58	27
7	2	6:24	26	3	6:27	25	1	5:59	30
8	3	8:29	11						
9	1	14:41	23	3	13:41	29	2	15:21	29
10	1	21:57	24						
11	1	5:20	30	2	6:21	30	3	5:46	29
12	2	9:10	30	3	9:37	26	1	10:58	30
		10:36	22.91666667		10:43	24.3		9:26	24.6

Bilingualism in the education of adolescents

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Abstract

The purpose of this research is to inform the public, specifically parents, about the drawbacks and benefits of being bilingual. This is an attempt to help them understand how this influences an adolescent's education, but also an attempt to influence the incorporation of dual after school language programs in K-12 schools. Bilingualism is the ability to speak and understand two languages. Factors that affect this can vary from simple things such as the opinion he or she might have about being bilingual, to the way their environment drives them towards or away from learning a second language. One of the barriers included in the research, for example, is code-switching, the ability to switch from one language another within a sentence or a conversation. The problem here arises when there is a confusion between the native language and a second language; for example, when the adolescent does not recognize the rules of when it is appropriate to use code-switching and when it is not. We also have the benefits of being bilingual. Aside from the advantage in communication skills, bilingualism also has an impact on cognitive thinking. Bilingualism can enhance skills such as brainstorming, reading, writing and problem solving. This is because a bilingual person is constantly thinking not only in one, but two languages, which allows more flexibility for critical thinking. This study attempts to provide an explanation of both the benefits and barriers that arise from bilingualism.

Keywords: Bilingualism, education, student success

Introduction

After a close observation of multiple published works that address different aspects of this subject, I have found that the impact bilingualism has on an adolescent's education differs from adolescent to adolescent. This is because each person's experience with education varies, and because their opinion of being bilingual can have a positive or negative role in their education overall. It is important to take into consideration the different factors that influence the impact bilingualism has on the education of adolescents. Factors vary from opinions he or she might have about being bilingual, to the way their environment drives them towards or away from learning a second language. Some questions that often result from this issue are as follows: What is bilingualism? What is code-switching of the native language and a second language, and how does it affect the individual's communication skills? The issue has multiple sides and arguments to it and this research will attempt to clarify, not all but at least, some of these factors.

Unfortunately, the study cannot give an accurate opinion on when bilingualism is beneficial for an individual, and when it becomes an impairment, because depending on the environment and level of bilingualism, such can come with both its benefits as well as its drawbacks. For example, an adolescent with

an advanced level of bilingualism will most likely have fewer errors and more control over both languages, as opposed to a beginner to intermediate bilingual speaker. In the latter option, intermediate and beginner levels will still have communication skills that will continue developing throughout their use and practice of both languages, but switching between the two languages will be a little more difficult in these cases. It is essential to keep in mind that each individual has a different experience with bilingualism. Each person perceives the outcomes differently depending on their circumstances, how much effort was put into the language acquisition, and the progress made. The research intends to show both sides of bilingualism in order to allow the parent to make his or her own conclusions and to help explain that, although bilingualism can improve communication skills as well as other skills, it is a complex process and the outcome can always come with its drawbacks. It is important for people, especially parents, to understand both sides of this subject because they should be well informed about the types of issues that can have a significant impact on their child's education. The questions simply serve to represent concerns from both sides. Findings support the claim that there are two sides to bilingualism and that it can become a hinder as well as a benefit in the education of adolescents.

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Background

The first question that arises when referring to bilingualism is what is bilingualism. Bilingualism is “the ability to speak two languages or the frequent use of two languages” (Merriam-Webster). Other question that arise from this is if bilingualism will affect the individual in the long term. This question will be addressed towards the end of the benefits section.

Benefits

Although bilingualism involves some drawbacks, it also has its benefits. For example, the impact it can have on an adolescent’s cognitive thinking. A study done by Olusola O. Adesope, Tracy Lavin, and Terri Thompson, mentions that “bilingualism has an impact on cognitive thinking”. These experts analyzed a combination of about 63 different articles that focused on the impact bilingualism has on grade-level individuals. They found that bilingual speakers demonstrate a greater metalinguistic awareness than their monolingual counterparts, for example, “the experience of acquiring and maintaining two different languages -with different forms and structures- allows bilingual speakers to develop an explicit and articulated understanding of how language works. Bilingual speakers have two different words for most concepts” ... “the process of learning the vocabulary, syntax, phonology, and morphology of more than one language, as well as learning how to use this body of knowledge in contextually appropriate fashion, may provide bilingual speakers special insight into their own cognitive processes and learning strategies” (Adesope 4). This means that most of the adolescents that speak a second language have the advantage of using the skills they acquire from their native language and relearn when learning the structure of a second language, to help them develop learning strategies for example in brainstorming, reading and writing.

According to Adesope’s study, “bilinguals also show evidence of enhanced problem-solving skills, particularly on tasks requiring executive control... because bilinguals have the capacity to choose between two languages, they may develop more flexibility with respect to thinking that can be applied to solve problems.” (Adesope 5). This means that adolescents that know a second language can develop good skills at planning and abstract thinking.

In 2007, a newspaper named *NJBIZ* from New Jersey published an article about “The Benefits of a Bilingual Workforce”. At the time, “nearly 335 languages were spoken or signed across the country” (*NJBIZ* 2007). The writer also mentions that “during the hiring process, business owners and hiring managers should actively pursue bilingual workers” because it gives them the benefit of an “access to a vast market”

and in order to “insure that their staffs have language skills to reach this market” (*NJBIZ* 2007). What this means for adolescents, that start a bilingual program at an early age, is that being bilingual will actually give them a better chance of getting the job they want as opposed to a monolingual individual. With the ever-growing globalization and inclusion of diverse cultures in the American culture, learning more languages can be quite beneficial for any individual. This can even affect their ability to work or find a job because nowadays more and more business owners look for employees with language skills, because those are the employees that can help expand the market to other horizons.

Barriers

The first barrier arises with bilingualism is when an adolescent speaks one language at home and another at school, as studies by the article “Contribution of Bilingualism in Language Teaching”. This becomes a problem because while the classroom setting is trying to help the student become proficient in the target language, at home the student is often obligated to speak only the native language. Unfortunately, “many people think that there is only room enough in a child or adult’s brain for one language,” as mentioned in the article, this is one factor that affects the perspective an adolescent has on his or her use multiple languages (Aslam 57). Parents’ support is a very important key in the development of a second language and if the parents appear to have a negative view towards this, the child will most likely follow that perspective. Another problem arises when those who have an important role in the adolescent’s learning have fixed or biased views on bilingualism. It becomes a problem because this does not allow the adolescent to create his own opinion of the subject, which can also alter their attempt to form their own identity.

The same article also mentions that “contrary to the idea that two languages confuse people, there is evidence that well-developed bilingualism enhances one’s ‘cognitive flexibility’” (Aslam 57). This is often one of the major issues because it can be quite difficult for an adolescent to have a single language well mastered and adding an additional language can be even more difficult, especially if he or she is constantly switching from their native language to the target language or vice versa. Sometimes this can become a major problem because as a student, he often does not have enough time to develop one of the two languages (or both) to the fullest and become proficient at it, but it all improves with time and practice. Thus, if the adolescent manages to develop an advanced control of these two languages, his skills and critical thinking will also improve.

Another issue that derives from adolescents’ use of multiple languages is what linguistics often refer to as

“code-switching” or “language-switching”. Code-switching is defined as “the switching from the linguistic system of one language or dialect to that of another. (Merriam-Webster), in other words switching from one language or dialect to another. “Language switching” as the name proclaims, has the same meaning as “code-switching,” although the Merriam-Webster dictionary has not yet included this word in its list of definitions. A study done by Julia Hofweber, Theodorod Marinis and Jeanine Treffers-Daller addresses the impact of code-switching on executive functions, for example learning, writing, reading. According to this article, “all bilinguals engage in insertion and alternation” (Hofweber 4). Insertion is when an individual incorporates vocabulary or grammar of one language into another. Alternation is when an individual uses two languages, one at a time and then alternates to the other but without mixing the grammar or structure of the two. As stated in this article, code-switching is completely fine when it has reached an advanced level, this meaning that the students has full control of when and where to use a mixture of both languages or choose one over the other. The only time it becomes a problem is when there is a dense use of code switching and the individual cannot control it. Using code-switching without control can lead to an impairment in the individual, since it can get in the way of the person’s ability to read, write, and speak. Meaning that the individual might start mixing the grammar structure of both languages, he might not be able to communicate well because each language needs their own structure to make sense when communicating. For example, if an individual is having a conversation in English and suddenly, he integrates some Spanish words in his conversation, he breaks the structure of the first language he used. This affects the conversation because if the other individual does not understand both languages and structures, then a problem with communication will arise. This is a major problem when the structure of these two languages that are significantly different are mixed together. If the structure of the two languages was similar, such as the structure of most Romance languages, there would be less of a problem even when there are errors in the their use of code-switching.

One of the most common types of errors that bilingual students come across is known as “calques”. Calques are “the adoption of a foreign meaning for a word that already exists in a language” (RAE). These are simply words borrowed from other languages when there is no accurate word in a language to define a word that already exists in another language. A very common example of this error is “parking” taken from English and translating it into “parquearse” in Spanish. Although Spanish already has the word “estacionarse” which directly means “parking”, individuals get caught

up in translation and begin inserting and directly translating words from one language to the other without realizing that these words might already have a meaning and word in the targeted language.

Research questions

Understanding the impact bilingualism has in the education of adolescents is important because it helps understand how it can hinder or further their learning. Some parents recommend that their children learn only one language; others recommend that bilingualism is fundamental. The findings can be placed in three main categories: the benefits, hindrances, and third option that indicates there is no impact on the individual’s learning. There is no point in having a fixated view on the topic because in the end everyone has a different perspective about it.

This research can be most beneficial to those who are currently confused about the topic, especially for those who are thinking about enrolling their children in bilingual programs, and to the children of the parents who seek for more knowledge about this issue. It is important to understand that the process to achieving an advanced level of bilingualism can be difficult and that the adolescent needs full support and encouragement because it takes a lot of motivation from the parents, as well as the adolescent to go through the process of a second or third language acquisition. Society as a whole can also benefit from this research since our society is made of multiple languages and cultures. Having knowledge of bilingualism itself can be beneficial towards society’s education. Nonetheless, this is a door for adolescents to explore, learn, and be accepting of other cultures, especially with today’s growth in globalization.

Methods

In an attempt to answer the proposed questions, I reviewed previous studies done in the areas of education and psychology. For this, I analyzed library resources and scholarly articles available online. The perspective of literary critics, linguists, psychologists and other professionals that focus in this issue is very important because they can explain problems that arise from bilingualism in a way that parents and even the students that are learning a second language can understand the process. Although this research does not give me the perspective of what the public thinks and reacts to this issue, I am hoping to expand my research in the near future by interviewing students in bilingual programs and their parents. In doing such, I believe it will help me provide a wider piece of information to the public and prove that, as mentioned before, most of the factors that

affect bilingualism depend on the individual's environment and support.

Conclusion

This study is important because it gives the public information about an issue that has recently been growing more and more in many cities in California. This specific issue has a high relevance in our society because of the growing globalization but also because it has the power to influence the education of adolescents and their knowledge and acceptance of the world. Parents should be well aware of the consequences of being bilingual; in order to make a decision that will best benefit the learner. Bilingualism expands our communication skills and develops cultural understanding. A bilingual person has more than one perspective, and is aware of more than just one world because such individual can think and express itself in more than one language, which can aid with critical thinking and problem solving. Overall the impact bilingualism has on a person depends on how focused

and advanced the person is in a second language, and most of all, the motivation that the individual is receiving from his environment. The more advanced the individual becomes in the levels of bilingualism, the less negative impact it will have on the individual because over the course of time and with practice, he will learn to master its use.

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Students as consumers: Undergraduate perceptions on higher education

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Abstract

Undergraduates' motivations to earn a Bachelor's degree are increasingly tied to their fears about gaining meaningful employment after graduation. As a preventive measure to insure they will be employable, students push themselves to achieve scholastically to distinguish themselves from their peers. Student achievement favors consuming the material for a course in order to pass with the highest grade possible. Very little of what is memorized is retained, meaning students begin to lack confidence in their ability as an academic; overall, this enforces consumerist behaviors, such as memorization, in order to hide personal insecurities about one's own intellectual abilities. This paper aims to explore how the role of the student within university has changed and whether the increase in consumer behavior has affected the student's ability to learn. In this study, 102 participants provided responses to a fifteen question survey about academic life. Emphasis was placed on each student's perceptions of professors, learning, and the worth of higher education. Supported by the data collected, I will argue that, by treating education like a business, students are products whose worth is based on external achievement unsupported by an accessible knowledge base. To address the problems found in modern higher education, a number of pedagogical approaches are explored to not only confront the pressures surrounding the university, but to call for more practical methods of examination that support meaningful learning.

Keywords: Education, consumer culture, college

Introduction

In a changing economic landscape, the need for highly-trained, specialized workers has increased the demands for quality higher education within the United States. The beliefs surrounding the modern job market tie employability closely to a degree from a distinguished university; thus, the response of the university is to market their degrees as a promise of social mobility and professional career opportunities (Williams and Wilson 47). This response is necessary because the role of the university has shifted from an institution that produces knowledge for the benefit of the public to a private investment paid for by the individual. Geraint Johnes, an Economics professor at Lancaster University, explains "The main beneficiaries of higher education... are the students themselves. Whatever contribution education makes to their productivity is reflected (in the free labour market) in their subsequent remuneration. The beneficiary pays principle thus suggests that the burden of paying for education should be borne by the student..." (113). Attitudes around education suggest that since students benefit from a degree, they should be responsible for the price. Of course this suggestion is not absurd, but the

cost of education continues to rise past what most young adults and their family can afford without some sort of financial assistance. For example, California State Universities have proposed increases to the cost of tuition for the 2018-2019 school year, and they assure students that most of the increase will be covered or offset by other financial assistance (calstate.edu). While the California State Universities are considered affordable collegiate options, students still need help paying for their education. Grants and other programs seeking to help individuals pay for their education have been cut, meaning funding for the university comes from government and industrial research opportunities, as well as the students themselves who pay tuition and other fees beneficial to the institution. To attract both research grants and students, public universities need to compete on a global level to distinguish themselves from other equally competitive schools (Slaughter and Leslie 17). This behavior is not new. Academic capitalism, defined as "institutional and professional market or market-like efforts to secure external money" (Slaughter and Leslie 8), describes the increased efforts to gain not only prestige for the university but steady funding from students, government and industrial connections. Academic capitalism is well defined

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within education, as a result, this paper focuses on the impacts changes to higher education have on students. Specifically, if capitalistic behaviors and the competitive nature of education has affected the role and the behaviors of students in university.

Methods

Participants

102 undergraduate students enrolled either in a four-year university or a community college submitted responses to a fifteen question survey online. Participants were between the ages of 18 and 40, with 91.9% being between the ages of 18-24. A majority of students held Senior class standing (45%) with Sophomores (24%), Juniors (21%), and Freshmen (10%) following as such.

A fifteen question survey distributed through an open link on Qualtrics was composed of both multiple choice and opened-ended written responses. The completion of the previous question was not a requirement to continue the survey resulting in the different numbers of complete responses to each question.

Measurements

Multiple choice questions are reported as the statistical results, while each written response to open-ended questions were compiled and their language classified by created categories. These categories reflect the words or groups of words found repeatedly in responses. Once the categories were identified, the words found in the responses could be counted once for each of the categories the language reflected. The categories are further explained in the results.

Results

Students, when asked to rank the importance of maintaining or improving their grade point average, selected: extremely important (48.4%), very important (30.3%), moderately important (19.1%), slightly important (2.0%), or not at all important (0.0%). The following question asked why maintaining or improving your current grade point average is or is not important. Ninety-eight collected responses were separated by language that represented intrinsic (internally motivated) or extrinsic (externally motivated) desires. From these two categories, commonly used words or phrases were identified and labeled as the following. Intrinsic desires most often represented a student's: personal standard (14.2%), work ethic (3.0), or desire to learn (2.0%). External motivations were referenced more frequently and categorized by GPA being important for: going or being accepted to a graduate school (32.6%), needing to be competitive (21.4%), a student's future career (11.2%), financial aid (9.1%), or

some kind of external representation of their identity (9.1%). The language found in the responses could represent intrinsic and extrinsic motivations; therefore, the language found in one response could be counted for each the potential categories it represented. Examples of the language used for each category is identified later in this paper.

Next, students were asked how they choose what courses to take to aid in the completion of their degree. Ninety-nine total participants responded that they took: the classes required to earn their degree (77.8%), classes that interested them (26.3%), and classes that teach useful career skills (6.0%).

The following four questions centered around student views on instructors. In a multiple choice list of different ways one might choose his or her instructor, students selected that they chose their professors by: using ratemyprofessor.com (31.4%), speaking with friends (28.3%), asking their peers (22.1%), consulting advisors or other faculty (8.9%), surveying or reading the instructors courses and work (4.4%), while most write-in answers reflected feelings of having no choice (4.9%). From ninety-nine responses, 22.2% participants agreed that they purposefully avoided difficult professors, but 65.7% of students selected that their avoidance of hard instructors depended on the type of course, and only 12.1% of students denied that they avoided difficult professors. Ninety-seven student responses defined expectations of a bad professor as: instructors are unsupportive or uncaring (34.0%), poor communication of expectations and assignments requirements (30.9%), unreasonable expectations (17.5%), lectures that are uninteresting (13.4%), professors who are unorganized (12.4%), and coursework that is too difficult (10.3%). 98 students defined their expectations for a good professor as: caring and supporting of students (52.0%), expectations that are clear (31.6%), material or a classroom environment that is engaging (31.6%), and available outside of class (13.3%).

Finally, the last five questions asked students about academic life. Ninety-six participants identified the qualities of successful students as: having a strong work ethic (47.9%), self-motivated (41.7%), organized (27.1%), and attentive (25.0%). Students then identified how they learn the material for their courses. Ninety-seven responses listed learning techniques categorized as: reading (47.4%), taking notes (38.1%), social/group learning (30.0%), attending class (27.8%), memorization of material (17.5%), and completing homework or example problems (11.3%). Following this, participants selected an option depending on if they felt being a student was stressful: definitely yes (76.3%), probably yes (17.5%), might or might not be (3.1%), probably not (2.1%), or definitely not (1.0%). Ninety-

six students then answered if academic stress affected their education and explained how this stress impacted them: 75% affirmed stress affected their education, 17.7% denied stress had any impact, and 7.3% were undecided about the impact of stress. Within these responses, 36.4% mentioned emotional distress such as crying, 33.3% write that it impedes learning, but 9.3% participants write they use stress to motivate themselves. Lastly, students were asked to select if they agree or disagree with the question, "Do you agree that the values associated with a degree (professional development, potential salary, knowledge gained) are worth the costs (tuition, time to complete)?" Ninety-seven Participants selected: strongly agree (19.6%), agree (30.9%), somewhat agree (27.8%), neither agree nor disagree (6.2%), somewhat disagree (6.2%), disagree (6.2%), or strongly disagree (3.1%).

Students' roles within modern education

A student's relationship with higher education has been redefined from an individual seeking knowledge to a "hardnosed utilitarian approach... where the student's first and foremost priority is to get a job in an increasingly ruthless employment market" (Cowden 42). Receiving a college degree has been equated to an entrance ticket to the next phase of a young adult's life, a middle step between untrained teenager and employable adult. A Bachelor's degree is often marketed as the best option for students leaving high school. For example, according to College Board, "In 2008, median earnings of college graduates were \$55,700, which was \$21,900 more than the median earnings of high school graduates who hadn't attended college" (Fuller). Students generally believe that college is worth the cost and time commitment because it will help them in the future. Of course, the data represents the benefits typical received by degree holders, but only those who find employment. While graduates have been able to enter the job market, they often end up being "underemployed," working in positions unrelated to their degree or finding only part-time work (Abel et al). Undergraduates are aware that there is competition when entering the job market, so students feel compelled to earn their Bachelor's degree in order to help secure their futures.

If the degree is the end goal and students fear not gaining meaningful employment, quality or meaningful education is not the student's main concern while in school. The approach students are taking within their education can be defined as student consumerism. As the title suggests, student consumerism is "attitudes towards education as a commodity versus a transformative intellectual experience" (Alvarez 65). Undergraduates practicing consumerist behaviors treat higher education as a bought service meant to train them

in the skills needed to be marketable in the current job market. Academic capitalism allows institutions to market themselves, and student consumerism aligns well within academic marketing. Students want a degree in order to get a job, universities need students to pay tuition and other fees to stay open, in many ways both work together in order to satisfy their respective needs.

In the competitive job market, people need to stand out and set themselves apart from other potential hires. It is understood that, "Postindustrial economies depend on personnel trained in colleges and universities and highly reward many, but they do not absorb all the graduates these institutions produce, posing problems for higher education's claim to provide social mobility and adequate returns on students' investment in learning" (Slaughter and Leslie 31). Students know they will be competing against their peers after graduation, but they cannot avoid undergraduate studies without being at a disadvantage while entering into the job market. Fears about the future push them towards achieving now as a preemptive protection. As a result of these demands on the student, academia is no longer about intellectual pursuit. A degree is an obstacle to master in order to be seen as a competent potential employee. Competition to be distinguished and the fear about finding employment feeds into the consumerist behaviors as that is a way for students to have direct control over their education.

The idea of transitionary period between child and adult is not new. A group of French student protesters, calling themselves Internationale Situationniste, created a pamphlet in 1966 about the problems they saw within their role as students in university. Their central argument was best written as, "Being a student is a form of initiation [into market society]" during which students live "a double life, poised between his present status and his future role. The two are absolutely separate, and the journey from one to the other is a mechanical event in the future. Meanwhile, he basks in a schizophrenic consciousness, withdrawing into his initiation group to hide from that future" (Internationale Situationniste). Undergraduates feel the pressures to enter into the job market, but cannot do much to ensure they will have meaningful employment after receiving a degree. This withdrawal into embracing their role of student reflects the need to take an active role in preparing themselves to be competitive in order to set themselves apart from their peers.

An example of this need to compete is seen in a student's desire to maintain or improve their grade point average (GPA). In the survey mentioned previously, ninety-eight students wrote answers to why or why not GPA is important. 32.6% of students felt they needed to have a high GPA in order to be accepted in either graduate school, a teaching credential program, or other post-baccalaureate program. Participants wrote similar things; for example "if I want to continue on to a

Masters I want to ensure I have a great grade point average,” “Has to be very competitive if I want a shot at med school,” and “more options for grad school.” From a student’s perspective, the ability to get into graduate school or other programs is based on his or her grades, rather than their intellectual interests or other achievements. Next, in 21.4% of the collected responses, students referenced GPA needing to be competitive for reasons other than graduate school; participants explained: “I’m an honors student, so they have a GPA requirement,” “To fulfill my scholarship requirements,” and “Competitive major requires high grades.” Finally, 11.2% of participants mentioned needing to keep their GPA in order to help them get a job after graduation. These students wrote, “It is an important determinant of my future career prospect,” and “It’s good to have a competitive GPA to place on entry level jobs.... Jobs look at it to see how committed you are to task and how seriously you are committed to responsibilities.” Again, most students felt a competitive GPA was required to help secure their future endeavors. 9.1% of students admitted that they used their GPA as an external representation of their identity. Participants wrote, “It is important because I felt that if I don’t then why am I in college,” “Important because it represents who I am and my motivations towards achieving my goals,” and “It’s also important because I’ve grown up with the mindset that my GPA is how intelligent and productive I am so I equate my value with how high my GPA is and if I don’t get straight A’s then I hate myself a little more.” A small amount of students seem to have conflated their achievement in school with their personal identity.

Next as a customer of the university, students are given a voice reflecting back their experiences to the administration. This voice usually comes from evaluation forms that students are expected to fill out close to the completion of a course or a degree. These evaluations are meant “to provide critical feedback about their classes and lecturers...” but often they reflect the feelings towards the subject and lack that “critical” evaluation of the quality or ability of the instructor or the relevance of the course (Cowden 47). Students see their achievement or failure and attribute it, in part, to their professors. Unfortunately, as an instructor’s ability to teach is increasingly based within these evaluations, “Instead of being intellectually challenged and forced to be placed in a position of failure, the overwhelming approach is to give students the information they need to pass the class and bring them closer to their degree” (Williams and Wilson 76). For example, if students want clear lecture material that can be easily tested by some formal exam, then they will resist collaborative projects, open discussions, or any activity that lacks a definite right answer. When the student acts like a consumer within education, the instructor becomes a service provider supplying the information demanded of

by students seeking to complete their intended degrees, because students feel more pressure to complete the course than they do to truly understand the material.

When reflecting on instructors, some examples of student definitions of bad professors are: “Unwilling to help students, monotone-type teaching, only reading off of PowerPoints, exams that had nothing to do with the material we had learned,” “Unorganized, doesn’t have office hours on at least 2 days, does not reply to emails,” “A teacher who is incapable of teaching effectively—close minded to the students opinions and needs.” From these examples, one can see how students use language that reflect a consumer mindset. Undergraduates express wanting clarity, support, engaging lectures, and open communication from what they consider to be “good professors.” Some examples of student’s ideas about good professors are: “Helpful instructions, desire for students to achieve, clear and concise teaching,” “Easier, more fun,” and “Great lecturer, doesn’t lecture straight off slides, responds promptly to emails, reasonable assignments and exams.” Instructors should care about the material and who they teach, make the material engaging, and be available for their classes outside of lecture, but students themselves should have equal responsibility and accountability for their learning.

When asked to how they learn, ninety-seven participants listed: reading, taking notes, social learning, attending class, memorization of material, and completing homework or example problems. Of the six types of learning, only social learning, learning that is done in a group setting, requires or involves active learning. Active learning requires the learner to be an engaged participant and take action while working with the material, but reading, notetaking, or sitting in a lecture does not require a student to be involved. In addition, when asked what makes a student successful, only 25% referenced being attentive in their own education; for example, one student wrote, “I feel that students that engage in the classroom, studies or becomes involved in their own way makes a pretty successful student.” 47.9% of responses mentioned “work-ethic” writing, “[students] study when needed, organized, focused, determined, they make school a priority,” or “Someone who does their work on time, studies for exams, does any assigned reading.” Students here did not express engaging with the material or doing anything past what is minimally expected from the professor (attending class and doing their assignments).

Overall, undergraduate participants did not express they engage with the material or instructors while pursuing a degree, but this may be explained by the lack of choice available to students. Students do not seem to have much of a choice when choosing what classes they get to take. From ninety-nine total participants, 77.8% wrote they took classes that were required for their degree followed by 26.3% adding they then take what

interests them. Students used language like, “Based on what it needed for my major and honors, and then what sounds fun or easier for the GE,” “I try to get my required classes, but I usually take the electives left that interest me,” and “I base it on what would work best to graduate within 4 years and what courses I need for my major and minor.” Undergraduates do not seem to be able to take a wide range of classes because of the requirements within their major, instead they jump from class to class in order to progress towards their degree.

The “road-map” version of education gives students a list of classes they need in order to get a degree, a redefined label for this progress is “Sat-Nav” education (Cowden 43). Like a GPS giving directions to a driver, students are told explicitly what classes and skills they need to have behind them in order to arrive at their destination. In this model, a degree is reduced to passing classes instead of proving oneself to be intellectually able. Sat-Nav practices enforce consumer behavior because there are easy benchmarks to pass in order to get closer to what is promised to students. As a result, students may be avoiding the challenge of a “hard” professor. From ninety-nine responses, only 12.1% of students denied avoiding difficult professors, while 22.2% agreed that they to avoid difficult instructors. The other 65.7% selected that it depended on the course.

Undergraduate students pursue an education in order to enhance their potential earnings and opportunities. The number of graduates has risen with the access to higher education, meaning there is higher competition within the job market to secure employment for the individual. The pressures around a student’s future, whether that be seeking a job or entering into a post-baccalaureate program, enforces consumerist behaviors such as memorizing material and demanding information rather than face intellectual challenges. Overall, the role of the students has changed due to external pressures as well a push from students whose evaluations shape how courses can be taught.

The impacts of consuming rather than learning

The role of the student has changed, as a result the perceptions and behaviors of the student has adapted to reflect problems with modern university. Undergraduate education is marketed to students as the best choice, both in terms of social mobility and personal investment. A degree represents being educated as well as employable. The drawbacks of such a view places emphasis on the object of a degree instead of the educational and personal experiences that should produce an educated, critically-thinking citizen. As a result, the perception of the general student population has been negatively affected and synonymous with “entitled.” Students themselves consume information in order to achieve high grades or academic honors, but

disengage with the actual knowledge they try to internalize. Undergraduates have been labeled as entitled, further complicating their relationship with education, and their consumer behaviors have risked learning becoming rote or meaningless.

First, among faculty within university, discussion about student or academic entitlement centers on the current generation in college. The Millennial, often described as self-centered, entitled and in need of constant external validation, represents most of the population currently in university. Behaviors associated with millennials have infused themselves with the behaviors of the students. Entitlement within education resembles student consumerism well. For example, entitlement suggests that students feel they should receive a high grade for completing the minimal amount of work (Singleton-Jackson et al. 232). Mentioned above previously, students do not seem to be taking an active role in their own education. From student responses, it seems that a bad professor is unclear, does not have manageable expectations, or is unavailable when the student needs them. From an educator’s perspective, students may be demanding more from professors, yet not being substantially engaged within the classroom or with the material. Research suggests that as entitlement increases, “counterproductive behaviors,” such as the shift of personal responsibility onto external figures or faculty, impact student’s perception of effort in relation to achievement outcomes (Taylor et al. 18). Meaning, as students feel more strongly entitled to a service from their teacher, the more they correlate the effort to complete an assignment to receiving a high grade. With the focus no longer on learning, students express their financial investment in education and their attendance should reflect their classroom achievement (Singleton-Jackson et al. 232-233). As professors feel more demands to lecture and administer easily exams to respond to the need for validation from students learning becomes more rote and students are being viewed as more entitled.

While academic entitlement is a developing term, the effects and general ideas are still valid within student life. Researchers note an element of control expressed in entitled behavior (Singleton-Jackson et al. 233). This control centers around classes, parking, and other day-to-day experiences, but the need for control can be brought further. At the center of student consumerism, there seems to be a need to feel control over learning resulting from their impending future. Students compete within a classroom, between one another within a school, and know they will be competing after graduation, yet there are no guarantees that what they do now will help them later. One result from these feelings of uncertainty and consumerist behaviors could be the amount of stress felt by the undergraduate population. In the National College Health Assessment, a bi-yearly survey that

collects data from the current student population, the American College Health Association (ACHA) found that of the 47,821 students surveyed within the last year, 44.8% experienced “more than average” and 11.6% felt a “tremendous” amount of stress (16). Within the same summary, the ACHA reported that 54.7% of students within the last two weeks “felt overwhelmed by all [they] had to do” and within the last year 49.8% felt that academics had been “traumatic or very difficult to handle” (13-15). The results gathered by the ACHA compare with the data collected for this research. In the survey conducted for this project, 75% of participants affirmed that academic stress impacted their education.

Although there was a small portion of students (9.3%) from the data collected for this research who felt that academic stress motivated them to do better, most students felt that stress either limits their ability to learn or creates a situation where they did not care about learning. Some of the more detailed responses explain the effects of stress on the participant’s education, from the ninety-six responses three were selected to summarize student attitudes:

Response One: Participant #8

“Academic stress does affect my education because then I'm not caring about whether or not I'm actually keeping the information for long term use but rather I'm freaking out about keeping it in my brain just long enough for the exam and then I don't have to worry about using the information ever again. I also don't have time to cultivate hobbies or my passions because if I do my hobbies then I feel guilty for not making myself a more competitive applicant for grad school or scholarships.”

Response Two: Participant #20

“Yes, it feels as if my entire career is banked in three test scores for a class. I worry that if I don't do well I wasted my time and money, so I chose to learn the material without truly learning or applying it but just for the grade. Stress and fear of failure inhibit me from doing assignments feeling that it is pointless in the end, then when I have late work I get more anxious about my classes and future. Blaming myself for not being caught up.”

Response Three: Participant #89

“Yes. I think this can be positive or negative. It can motivate you to do your work and achieve your goals, but it can also cause you to sit at a desk at 3am and cry because you have so much stress you're not sure what to do or how to realistically achieve your goals.”

These responses show how some students feel overwhelmed by the amount of work they have, guilty about not doing enough to make sure their future is

secure, and frustrated that their education becomes about tests rather than real world application of knowledge. Overall, these fears and anxieties lead undergraduates to lack self-confidence, which gives another reason for students to become consumers within a university rather than learners.

A concerning problem rising out of students lack of confidence in themselves is seen through the increasing desire to define oneself through achievement rather than personal beliefs, interests, and other intrinsic values that can be called on in times of stress. As an individualist society, a person’s worth is valued by what they have achieved for themselves, and while our society has diverted from socially collaborative work, the individual has had to take responsibility for defining one’s own identity in order to belong. This “identity is achieved through performance at school and through career... (James 34). Research suggests that a strong sense of identity acts “as a potential link moderator” between stress and other problems facing students (Burt and Paysnick 368). For the undergraduate population to call yourself an “academic” means to have already done something worthy of scholarly praise, but in most cases that worth is found in one’s grade point average. Since identity as a student becomes connected with ability to achieve academically, education diverts away from pursuing knowledge into consuming information to pass the course and create temporary reassurance that one is competitive as a student with potential to be a desirable candidate for either a job or graduate programs.

Conclusion

In addressing the need for a new pedagogical approach Henry Giroux wrote, “To study pedagogy should never be confused with being told what to do, but it does require new forms of graduate study which fully implicate university faculty in real struggles to define educational projects that are truly transformative. It requires, as we shall see, ultimately abandoning the naming of our students as clientele” (133). How to ensure students learn best should never be a “how-to guide,” as learning can never be reduced to simple steps. What many educational theorists, both currently and in the past, stress is the need to engage students with knowledge that reflects the world they will have to live in. Students as “clientele” will expect a service and will be considered an individual to please rather than a potential equal to challenge and educate.

Paulo Freire, in *Pedagogy of the Oppressed*, wrote in 1968 of a type of teaching that reduced the student to a “receptacle” the teacher must fill with his knowledge. He called this the “banking concept of education,” as the teacher holds all the information and makes deposits into their pupils (Freire 58). Students taught under the banking method are seen as passive as any active

engagement would interrupt transmission of the material (Freire 59-60). For example, if a lecturer were to be relaying the plot of a novel, a student questioning the motivations of a certain character would be a distraction from the main goal of the lesson- how to summarize. Under Freire's model it is the teacher who places himself in front of the students, but in the consumerist model the students are the ones who elevate the professor in order to receive explicit instruction that will not require more than passive engagement through the completion of formal assessments like exams or research papers. Approaches that encourage passivity become problematic because, as Freire writes, "Verbalistic lessons, reading requirements, the methods for evaluating 'knowledge,' the distance between the teacher and the taught, the criteria for promotion: everything in this is ready-to-wear approach serves to obviate thinking" (63). The "ready-to-wear" is what consumer education strives for. Instead of learning being a challenge, educated individuals regurgitate information as a demonstration of his or her ability to pass a class. Education that is consumed promotes the transmission of material from one person to another, but it lacks critical thought.

Students who refuse to take an active role within the classroom will associate learning with the attitudes developed from their undergraduate courses. John Dewey, an educational theorist from the 1930s, expressed that students will experience "collateral learning" as a result of their time within a classroom or with a certain instructor (48). If applied to the situations experienced by undergraduates, the feeling of mental distress, the need to achieve within the classroom, and the fear of the future, students graduate associating learning with a powerlessness and need to consume information rather than develop a motivation to truly acquire critical knowledge about the world. When entering into a new job, these attitudes could impact how young adults approach learning the skills needed advance within their field. Even within everyday life, citizens in a democratic society should be knowledgeable about relevant social, economic, and political movements that may influence our collective future. If "learning" is the collection of facts without critical dissection of their meaning and associated with negative feelings of distress and necessity rather than intrinsic desire, then will graduates want to continue educating themselves past what is required?

Of course, as a student, I recognize not only my bias, but my lack of experience as an educator. In continuing this research and my own education on the changing landscape of higher education, the need to collect insights from instructors and administrations becomes apparent. In order to best help the entire system of postsecondary education, more dedicated insights from all parties involved needs to be explored. I have relied

on research in search of solutions, but even then there are individuals calling to embrace the changing landscape of education by giving in to student demand. Cristina Chow and Clement Leung, in *Reshaping the University for Survival in the 21st Century: New Opportunities and Paradigms*, argue that in order to create meaningful and efficient experiences for students who need to compete in a narrow job market the university need to embrace technology and teach students how to learn in an environment in a practical manner (84-88). The learning the authors argue for still focuses on teaching skills for finding information, embracing industry connections to teach students what employers want employees to have, and other ways that still involve students consuming knowledge.

Even so, Stephen Cowden and Gurnam Singh in their book *Acts of Knowing: Critical Pedagogy in, Against and Beyond the University* argue for a humanistic view of education (8). The authors want education to give individuals the tools that allow them to question the way the world comes to be, and how, with that knowledge, people can create change or invoke the ability to have agency in one's life (7-8). Paulo Freire noted that education that fostered passivity and discouraged active engagement lead to a "fatalistic" view of the world around them, which can be comparable to the feelings of fear, overwhelming stress, and emotional distress reported by undergraduates. He writes, "If individuals are caught up in and are unable to separate themselves from these limit-situations, their theme in reference to these situations is *fatalism*, and the task implied by the theme is *the lack of a task*" (Freire 105). "Limit-situations" refers to any situation where internal forces or beliefs limit someone from expanding their own consciousness. As students, and citizens of a country, the ability to expand one's mind to create a fuller idea of the world around oneself allows for creation of new knowledge. Consumption of information, as done in student consumerism, does not give students critical knowledge that can be transferred from classroom to world. Thus, a view that the world will always remain the same without any chance of change.

Within the classroom, opportunities to allow students to participate in the acquisition of knowledge should be stressed. Moving away from the lecture to exam format can lead to engagement that can be used to reflect student learning, while creating room for creative new expressions of that knowledge. For example, the TESOL (teaching English to speakers of other languages) program on Stanislaus State's campus has students give lesson demonstrations in foreign languages to stimulate for monolingual peers the difficulties of learning a new language. Presenters are challenged to create an engaging activity for a class who has little to no knowledge of this spoken language, and

in order to be successful one has to put into place the methods and approaches learned within the class. Much of what is demonstrated exemplifies what these student would potentially present to their own classes, which gives the students a chance to implement the theoretical concepts learned in the classroom and an opportunity to practice the skills they need in order to be a professional teacher. Yet, even this feeds into the desire to teach students skills rather than challenge them to critically evaluate the knowledge they have.

As the world progresses, both in terms of growth within our understanding of learning but also in our social relationship to knowledge, curriculums should be updated and expanded to address the changing landscape of higher education and the diverse needs of students. Universities are still a place of academic pursuit, but the administration understands that students coming to them are in desperate need of a degree in order to jumpstart their professional career. A happy medium between what is needed to be learned in order to be a competent competitor within the current job and instilling a responsibility to be and remain educated in order to be engaged in the world must be struck. How best to find that balance needs to be looked at from a multitude of perspectives, and may require a different approach by each university in order to reflect the needs of the population. While students play a part in the business of education, the student should not be anything less than an individual seeking knowledge in order to improve his or herself.

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Predicting Latino academic success: The impact of college aspirations and mentorship

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Abstract

Success in higher education can be a complex process, especially for students of color. Latino students, for example, experience multiple, interconnected factors that affect their chances of earning a bachelor's degree. For some students socioeconomic background, race/ethnicity, gender, access to financial aid and citizenship affect their graduation from a higher education institution. While there has been an increase in the rate of Latino students entering higher education in recent years, their graduation rate still lags behind whites. In my research, I take a different perspective from the common demographic factors contributing to or hindering college academic success. I focus on the role of childhood college aspirations and the role of mentorship on long-term academic achievements of Latino students. My data is drawn from Waves 1, 3 and 4 of the National Longitudinal Study of Adolescent to Adult Health (Add Health) conducted by Kathleen Mullan Harris at the Carolina Population center at the University of North Carolina at Chapel Hill.

Keywords: Education, student success, Latinx, mentorship, college aspirations

Introduction and literature review

Not all students are successful in graduating with their bachelor's degree. More importantly, students of color are less likely than their white peers to graduate. For example, Hispanics are the largest minority group, but they are the lowest to have graduated in higher education (Means and Pyne: 2013). Being a first-generation student adds another barrier for each student from graduating with a bachelor's degree. These students do not know and are not familiar with what is expected from them in a higher educational system. They have no other role model to look upon as an example, and most students are confused and find it hard to be successful. Therefore being a first-generation student and a student of color does require more of an effort to stay focused and motivated to complete a Bachelor's Degree.

Latinos/as fall behind in academic achievement in comparison to other racial groups (Jeynes: 2015). For this reason, racial achievement gap is a major issue that needs to be addressed. As an illustration, Jeynes (2015) states, "by the eighth grade, the achievement gap is usually about two years". The achievement gap between Black and Latino/a students and whites has been an issue long before students entering higher education. Jeynes (2015) also proposes a few solutions to this issue, but there is one in particular that has not been initiated formally and or completely. This solution is cultural and

requires learning style solutions (Jeynes: 2015). According to the author, "the American schooling system needs to demonstrate a greater degree of cultural sensitivity and awareness of the fact that different children have distinct learning styles. These individuals assert that contemporary American schooling is geared toward teaching Caucasian students" (Jeynes: 2015). In other words, the educational school system and its curriculum have significant impacts on students of color and their academic success in higher education.

Having a sense of belonging while attending a higher education institute is critical for student success. According to Patricia Y. Talbert (2012) "Students who have a greater sense of belonging to the academic environment are comfortable with matriculating through the process and have a higher chance of completing their degree program." In other words, students will feel more confident and comfortable to seek help with their academics.

For many students of color, especially Latino students, believing they belong or feel welcomed in a higher educational institution may be a critical factor that impacts their educational outcomes. According to Noah Borrero (2011), Latino/a students tend to feel lost, and have to make a complex decision about cultural connections and whether they should focus more within their academics or be involved within their cultural group, thus, creating a greater void for Latino/a students' feeling like they belong.

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It is also important to consider how educators perceive Latino students. In Ramirez's piece (2017) the author elaborates on how Latino students who are doctoral candidates are viewed by some faculty members less worthy than their white peers. In addition, Ramirez (2017) discusses how faculty "invest less in women and racial/ethnic minority doctoral students—especially women of color". Clearly there is a racial achievement gap within the educational system, but in Ramirez's piece she mentions that "Chicano/Latino(a) graduate students encounter... institutionalized racism, sexism, and classism in the form of low faculty expectations, stigmatization, alienation, racial isolation, tokenism, stereotyping, lack of faculty mentorship and support, hostile departmental and institutional climates, and racially biased epistemologies and Eurocentric curricula" (Ramirez: 2017). All being said, it is shocking to hear that at this level of the educational institution Latino/a students experience this. Therefore, one must ask do other Latino/a students experience these types of issues at lower levels of education? If so, are these sets of issues the reasons why some students of color are not graduating?

Parental involvement is also a key factor that impacts Latino/a students' educational outcomes. According to LeFevre and Shaw (2012) there are primarily two types of parental involvement: formal and informal. Examples of formal parental involvement are volunteering at schools and attending PTA meetings. On the other hand, examples of informal parental involvement are emotional support and *consejos* (LeFevre and Shaw: 2012). In LeFevre and Shaw's (2012) article, they discuss that Latino parents participate more in informal parental involvement than in formal. The reason behind this is because parents use their *consejos* to discuss with their children the hardships and struggles they will face if they do not go and graduate in college. Similarity to Madrid's piece Latino family dynamics hold higher education with great importance and value.

Methodology

The research design for this study is quantitative. For the quantitative approach, data was drawn from The National Longitudinal Study of Adolescent to Adult Health (Add Health). More specifically, data was drawn from Waves 1, 3 and 4. Add Health studies "how social environments and behaviors in adolescence are linked to health and achievements outcomes in young adulthood" (Add Health 1994, 2001, 2008).

Research question

How do the role of childhood college aspirations and the role of mentorship affect long-term academic achievements of Latino students?

Hypotheses & findings

From this study, I have conducted a comparative analysis between Latino and white students. It is important to compare and contrast the significant differences between both demographics. In order to better understand how both childhood aspirations and mentorship impacts Latino students' academic success in higher education, three hypotheses have been tested:

- Between white and Latino students, there is a significant difference in educational attainment.
- Childhood college aspirations have a significant impact on Latino educational achievement.
- Having a mentor has a significant impact on Latino students' educational achievement.

From Add Health it was necessary to have a descriptive background as well as the sample size from both Latino and white student participants.

As demonstrated in Table 1, the total sample size is 3,534. Although this is a sufficient amount of participants it is critical to take note that out of 3,534 only 522 are Latino students. It is also important to see that 78.2% Latino students are native-born citizens while white native-born citizens are at a 99.5%. Another variable that is significant is parents' highest level of education. In the table above for white parents the highest level of education is classified as some postsecondary education. In comparison to Latino parents, their highest level of education is a high school diploma. Therefore providing evidence about Latino Students not having a role model who already has experience within the higher educational institution.

Although knowing descriptive background information for this study is necessary, knowing the differences between both Latino and white student populations is critical. More specifically, the differences of race for highest education levels through a chi-squared provided a clear statistical analysis where Latino retention rate are categorized.

From the chi-square in Table 2, it is notable that white students who have completed some college are at a 32.20%. White students who have completed college are at a 22.70%. Even though the percentage dropped by almost ten percent, whites in general have a strong percentage of students entering and completing college. In comparison to Latino students, the outcome percentages are not the same. For example, Latino students who have completed college are at a strong 35.90%. In spite of having a strong percentage in the "some college" category, it is visible to see a drastic drop in percentage. Latino students who have completed college are at a low 14.10%. Meaning, much of the

students who entered a higher educational institution have made an early exit. Correspondingly to hypothesis 1, white and Latino students perform significantly different at a significance level of .001, with white students achieving higher levels of education than Latino students. Needless to say it is essential to critically question what factors affect this outcome for Latino students and how should it be addressed.

Whether childhood aspirations are factors which could affect Latino students' educational outcomes is important to study. The second hypothesis states childhood college aspirations have a significant impact on Latino educational achievement. According to the OLS regression table it is notable that yes it is, but only when it is a desire to attend college. For instance, it has a significant positive impact on educational outcomes to Latino students who have a childhood desire to attend college. For Latino students, the desire to attend college has a greater significance, 0.240, than white students, 0.084. Yet, there is no significant impact for Latino students when childhood aspirations are the likelihood of attending a college. Here is it notable that white students have a higher significance of 0.252 than for Latino students, 0.097. To summarize, Latino students have a significant difference with regards to wanting to attend college, but the reality of them attending college is seen as an obstacle.

Mentorship for many students may be important in order to achieve academic success. Therefore, for this study the third hypothesis is, having a mentor has a significant impact on Latino students' educational achievement. From the OLS regression in Table 3 it is evident that for Latino students mentorship has a significant positive impact on the educational outcomes. In comparison to white students, Latino students have a significance of 0.246 whereas for whites mentorship has no significant impact in their educational outcomes. Given these points, Latinos who mentor(s) are more likely than their white peers to have a positive impact in their education. Thus, mentorship for Latino students and generally for students of color is an essential factor for academic success within higher education.

Discussion

As can be seen from the various tables and statistical analysis, white students had an overall greater significance within the variables, while Latino students did not. Partly why this is evident is due to the sample size and its lower variability among Latinos. There is other evidence from these tables that is as equally important as those stated previously. The results and differences between both Latino and white studies can be justified by suggesting the persistent impact and explanatory value of structural racism within the educational institutions and possibly within the survey

itself. In other words, the structure of the survey and the types of questions being asked are insufficient. There is great importance in understanding how the survey is structured and distributed. Perhaps the types of questions were not adhering towards Latino students and only towards whites. Therefore, this skews the end results of statistical analysis.

The analysis also demonstrates that native-born citizenship and higher levels of parent's education significantly improves educational outcomes for Latino students. Although the results about parent's highest level of education and the motivation it attaches to Latino students to become successful in higher education is not something new, it is necessary to bring awareness to the fact that many of these students see education as a way to build social capital.

Whether or not being a native-born citizen was not a main focus for this study, but with the end results of the study, it is a factor with a high significant impact for Latino students. For example, Latino students who are native-born citizens are a 78.2%. While for white students 99.5% of them are native-born citizens. Thus, concluding that there is a legal toll on Latino students. Although this may be true, it is important to also become aware that there may be a potential toll in having the sense of belonging, and achieving a higher education when the status of citizenship comes into play.

Further research

Returning to the initial cross-tabulation chi-square table (Table 1), Latinos are overrepresented in the "some college" category, which signifies an early exit from higher education. Therefore, more research needs to be done to explore this area and find what causes this, but most importantly propose solutions. For example, as seen from the end results of this study, mentorship has a significant impact on Latino students. If this is the case, then how do we expand the importance for students of color to be in a mentoring program? Firstly, it is important to establish more mentoring programs within higher educational institutions that focus on having faculty and student of color demographics. In addition, it is also important to change any mentoring programs, especially if students of color have not been in such a program or feel the need to improve it. Latino students are entering higher education institutions, but the majorities are not completing their degrees. There is a need to have solutions for this issue and a call to action to inspire, motivate and allow students of color to graduate.

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Table 1: Descriptive statistics of samples

<i>Descriptive Statistics of Samples</i>			
	Full Sample	Latino Sample	White Sample
N	3534	522	3012
% Female	53.4%	51.2%	53.7%
Mean Age in 2008	28.94	28.99	28.94
% Native-Born Citizens	96.4%	78.2%	99.5%
Mean Household Income During Childhood (1994)	\$41,000	\$27,000	\$45,000
% Language Other Than English Spoken at Home During Childhood (1994)	6.40%	41.40%	0.70%
Median Parents Education Level	Some Postsecondary Education	High School Diploma	Some Postsecondary Education

Table 2: Cross-tabulation for race by highest education level completed with chi-square

Crosstabulation for Race by Highest Education Level Completed with Chi-Square									
		Less Than High School	High School Diploma/G ED	Some Vocational Training	Completed Vocational Training	Some College	Completed College	At Least Some Graduate School	Total
White	Count	169	397	83	176	864	610	386	2685
	Expected Count	182.5	417.2	86.1	177.3	877	579.8	365.1	2685
	% within Racial Group	6.30%	14.80%	3.10%	6.60%	32.20%	22.70%	14.40%	100.00%
Latino	Count	41	83	16	28	145	57	34	404
	Expected Count	27.5	62.8	12.9	26.7	132	87.2	54.9	404
	% within Racial Group	10.10%	20.50%	4.00%	6.90%	35.90%	14.10%	8.40%	100.00%
Total	Count	210	480	99	204	1009	667	420	3089
	Expected Count	210	480	99	204	1009	667	420	3089
	% of Total	6.80%	15.50%	3.20%	6.60%	32.70%	21.60%	13.60%	100.00%
Chi-Square Significance		0.000							

Table 3: Ordinary least squares regression for highest level of education completed (Wave 4, 2008)

	Latino Sample N=286		White Sample N=2166	
	Model 1	Model 2	Model 1	Model 2
	Constant	*		**
Sex	0.092	0.030	0.153***	0.109***
Age	-0.007	0.039	0.045**	0.071***
Native-born Citizen	0.139**	0.128**	0.046**	0.038**
Household Income as Child (1994)	0.088	0.052	0.159***	0.122***
Language Spoken at Home as Child (1994)	0.012	-0.027	-0.054**	-0.056**
Parent's Highest Level of Education	0.057	0.095*	0.374***	0.281***
<i>Childhood College Aspirations (1994)</i>				
Wanted to Attend College as Child		0.240**		0.084**
Likelihood of College Attendance as Child		0.097		0.252***
Mentorship		0.246***		0.020
Adjusted R-Square	0.018	0.220	0.219	0.307

* = 0.1 Significance; ** = 0.05 Significance; *** = 0.01 Significance