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# The Undergraduate Review

A JOURNAL OF UNDERGRADUATE RESEARCH AND CREATIVE WORK



“The Elements” costume set designed by Lee Anne Wentzell  
Models: Connor Parker (earth), Ashley Knott (fire), Kacy Blais (water), Arianna Zikos (air)

Allen, Baker, Bernasconi, Boivin, Correia, Dickerson, Fitzgerald, Gerring, Houldcroft, Kane, Kelleher, Lagasse, Leonard, Mathews, Pacheco, Pasciuto, Portway, Skrabec, Stoltz, Sun, Spicer, Svoboda, Viltus, Westgate



# THE UNDERGRADUATE REVIEW

Volume XII 2016

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## **On the Cover:**

“The Elements” costume set

**Lee Anne Wentzell**

For my final Advanced Sculpture project I designed and created a four-piece costume set inspired by the elements earth, fire, water, and air. Through this project I learned to work with new materials and adjusted to using the human body as a medium. For each element I wanted to capture a specific mood. Earth is the origin of all elements. It is the nurturing, stable source of life. Without the Earth we would have no existence. Fire creates light and warmth while transforming the space around it. It can mesmerize, destroy, and comfort. Fire is a powerful element full of energy and passion. Water comes in many forms and is transforming like fire. It will flow and seep its way out of any crack, but when frozen it is solid and compact. Air represents time, direction, and movement. Although air may seem to be a simple element, it is rather complex; it allows living things to thrive.

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# Undergraduate Review Volume XII

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# Processes of Racialization through Media Depictions of Transracial Violence

MEGAN ALLEN

## Abstract

In this research project, I explore the process of racialization in media coverage of White-on-Black violent events (both crimes and incidents not recognized by the legal system as crimes) using a critical race theory framework. The past three years have seen a series of killings of and assaults on African American people that have become newsworthy, as they have been seen, often controversially, as unjustified. The controversy has largely broken down on racial and political lines, with minority Americans and the left seeing these incidents as evidence and example of ongoing racial inequality, with whites and the right, in particular right-wing whites, denying that race is a relevant category. By using critical race theory's understanding of race and racism as active social processes, I trace the assumptions, politics, and social consequences of media coverage across conservative, centrist, and left media outlets. For the purposes of this research, 298 news articles from varying sources were collected and examined.

## Introduction

Communicative technology has forever changed the way the public receives the news. Media outlets are continuously producing and sharing knowledge through platforms that are accessible to nearly every citizen of the United States. Individuals now have a wide range of options as to which platform they choose to receive their news

from. Along this spectrum of politically and socially diverse media outlets emerges differentiating narratives of individual subjects.

The importance of scrutinizing knowledge production is the first step in grasping the inseparable relationship between knowledge and power. Those who hold power hold influence over knowledge, which in turn holds the power to influence human behavior. Acknowledging this leverage over human inquiry requires that we view formal (education, media, the criminal justice system) and informal institutions issuing knowledge through a critical lens. Critical Race Theory is one such lens through which intersections of power, framing, and perceptions can be examined. Critical Race Theory views racism as a fundamental presence engrained in nearly every social and formal institution in the United States, whether we chose to believe it or not (Bonilla-Silva, 2014).

Recent years have seen the media following incidences of police-on-civilian violence, specifically ones where the target of police attention is an African American male. Incidences such as these, and the presentation of these incidences to the public, have fueled racial tensions and given rise to social unrest.

One of the more significant incidents explored by the media and the public was the shooting and killing of Michael Brown on August 9, 2014 in Ferguson, MO by former police officer Darren Wilson. In the wake of his death not only was there extensive coverage of the incident, the parties involved, and the communities affected, but also of the subsequent protests, riots, and calls for change. The reactions to the death of Michael Brown and the perceptions of how well justice was administered has polarized the public and has seemingly pinned minorities and authority figures against each other along political lines.

This paper seeks to examine the range of narratives on racialized incidences of violence by various media outlets by using Critical Race Theory as a framework. There will first be an overview of Critical Race Theory, the use of framing as a mechanism to justify racism, and how both may be used to assess race in the media. There will then be an examination of how the media operates, how it depicts race, and possible motivations behind particular framing



techniques. Finally there will be an analysis of how one might use Critical Race Theory to trace assumptions of racism and politics from media coverage of transracial incidences of violence, such as the killing of Michael Brown.

## Literature Review

### Critical Race Theory and Framing

Critical Race Theory is a framework, a movement, and an academic discipline that maintains that society is at all levels divided along racial lines (Delgado, 2012). Critical Race Theory is considered to have begun with the works of Law school professor Derrick Bell in the 1970s. Bell sought to examine the intersections between power, race, and the law. Since Bell, Critical Race Theory has been used to examine similar intersections of race and power in history, education, the media, and in other political, social, and economic realms (Delgado, 2012).

Critical Race Theory was born from a need to further explain and acknowledge inherent racism in society. Even today, over 150 years after the signing of the Emancipation Proclamation, racial minorities continue to remain disadvantaged compared to whites in nearly every area of social life. According to a study by social scientist Dr. Eduardo Bonilla-Silva, “[blacks] are more likely to be poor than whites, earn about 40% less than whites, and have about an eighth of the net worth of whites” (Bonilla-Silva, 2014). Additionally, studies have shown that people of color are more likely to receive an inferior education compared to whites and will have less access to the housing market. Within the realm of the criminal justice system, people of color are consistently overrepresented at all levels including arrests, convictions, incarcerations, and executions (Bonilla-Silva, 2014). These alarming disparities, among many others, beg for an explanation. While some still deny racism exists in our post civil rights society, critical race theorists contend that racism not only still exists, but is a permanent fixture in the structure of our government and society (Delgado, 2012).

As a broad field of study, numerous scholars have identified varying approaches to applying critical race theory. In one of his

books, *Critical Race Theory: An Introduction*, Richard Delgado loosely outlines six tenets of Critical Race Theory. The first is ordinariness, which essentially states that racism is difficult to cure or address (Delgado, 2012). This means that colorblind or “formal” conceptions of equality can remedy only the most blatant forms of racism. The second tenet he refers to as material determinism. This element establishes that, because large segments of the population are white or privileged, there is little incentive on their part to eradicate systematic racism purely out of self-interest (Delgado, 2012). The third tenet Delgado refers to as social construction, which holds that race and racism are products of social thought and relations. Race is not a result of biological or genetic coding, but rather social categories created out of manipulation and convenience (Delgado, 2012).

The fourth tenet outlined is differential racialization, which argues that a dominant society racializes minority groups at different times in response to shifting needs (Delgado, 2012). This would explain both slavery as resource for free labor and more recently the stereotype and abuse of Mexican labor for agricultural advances. A fifth tenet refers to intersectionality and anti-essentialism as a way of explaining that no person has a single unitary identity. Instead, Delgado makes the argument that because individuals possess multiple backgrounds and characteristics, everyone has overlapping identities and loyalties (Delgado, 2012). For example, an African American may share their heritage with other African Americans, but that individual may also be Jewish, homosexual, or possess any number of combinations of identities. The final tenet outlined describes a unique voice of color. Though it slightly contradicts the previously mentioned tenet, this ideal asserts that experience with racism and oppression means a right to “legal storytelling.” In this way, Delgado argues that minority status brings with it a competence unparalleled by whites to race and racism (Delgado, 2012).

A crucial component to understanding racism as an active force in formal and informal institutions is to recognize the use of framing. We have established that through the lens of Critical Race Theory, institutions such as schools, the criminal justice system,

and the media contribute to systematic racism by maintaining and supporting racial inequality. We also know that through positions of power, knowledge is easily created. Framing therefore is the vehicle through which knowledge may be transformed into a deliberate message. Not only does the framing of a particular situation allow the viewer to interpret or misinterpret reality, it also drives the formation of opinions and beliefs.

In regards to systematic racism and understanding any dominant racial ideology, social scientist Dr. Eduardo Bonilla-Silva developed four central frames largely used by United States society to perpetuate racial inequality while denying it all together. The four frames of this “color-blind racism” are abstract liberalism, naturalization, cultural racism, and minimization of racism (Bonilla-Silva, 2014). Through the use of these frames, Bonilla-Silva makes the argument that central elements of liberalism have been rearticulated in post-civil rights America to rationalize racially unfair situations (Bonilla-Silva, 2014).

The frame of abstract liberalism involves using ideas associated with political liberalism (equal opportunity) and economic liberalism (choice, individualism) in an abstract manner to explain racial matters (Bonilla-Silva, 2014). The use of abstract liberalism allows the dominant race to avoid tackling real race-related issues, like the underrepresentation of minorities in high-paying occupations, by standing behind phrases and practices such as “equal opportunity.” Rather than acknowledge historically and culturally significant reasons why minorities receive less pay and achieve lower net worth than whites, whites stand behind abstract liberal ideals. It is beneficial to explain these disparities in a way that allows them to avoid blame. By making claims that minority shortcomings result from a lack of effort or drive on their own behalf, whites avoid self-blame and the responsibility of identifying or rectifying the structural racism.

Naturalization is a frame that operates off the assumption that racial phenomena can be explained by suggesting they are natural occurrences (Bonilla-Silva, 2014). An example of this would be regarding the formation of racially homogenous neighborhoods as “natural” or based purely out of preference. In reality the segregation

of neighborhoods has significantly more to do with structural racism within the housing and real estate markets than it does with any “normal gravitation.” This method of rationalizing what appears to be natural occurrences is one way of masking the underlying racism.

Cultural Racism relies on heavily on culturally based arguments to explain the socioeconomic standing of minorities (Bonilla-Silva, 2014). This frame utilizes stereotypes and assumptions of races to justify disproportionate social standing while protecting white superiority. This frame may seem to be the most blatant method of maintaining racial inequality, however, it can easily be presented in passive, seemingly harmless way. For example, making the argument that “black people are always late” allows others to rely on this as an explanation for why they don’t receive job opportunities at the same rate as whites. Not only does this reinforce negative perceptions of African Americans in society, but also prevents further examination of racism.

Minimization of racism, the final frame discussed by Bonilla-Silva, suggests that discrimination is no longer a central factor affecting minorities’ life chances. This frame, more so than any other, seeks to disregard racism as an existing issue in society. This frame allows the public at large to feed into the delusion that since blatant discrimination no longer exists, that racism too does not exist. Through this frame, whites and members of a higher socioeconomic status flip the use of excuses around on the minorities (Bonilla-Silva, 2014). Minimization is used primarily when a minority experiences a form of attack or rejection based on their race and chooses to speak out about it. Rather than accept the fact that discrimination transpires, whites will minimize the damages and claim that the minority is “using race as an excuse” to achieve some ulterior motive. Through this frame, the infamous “race card” is perceived to be played, and whites are more easily able to disregard the claims of racism.

The powerful explanations used by whites not only allow them to justify and ignore racism, but also maintain whiteness as a privilege. The ties that can be drawn between critical race theory and framing are best understood when examined through an

institutionalized system which uses its powers to covertly support color-blind racism. As one of the most influential producers of knowledge and news, the media is fit for such an examination.

### **The Media and Influence**

As previously mentioned, the increasing availability of technology has made accessing news as simple as turning on one's television. Prior to the broadcasting of news, the only sources of crime news were in print. By broadcasting news, media outlets are able to communicate with the masses on a more personal level. For many households, watching the news, specifically crime news, has become part of a daily routine (Bing III, 2010). As crime has become an intrinsic part of modern media coverage (one study found that crime can account for up to 50% of news coverage), it is important first to examine why there is such a focus on crime from media outlets before the content can be assessed (Schildkraut, 2012). One study conducted in 2010 aimed to analyze the media's distortion of homicides in Baltimore.

Researchers Jaclyn Schildkraut and Amy Donley identified three main reasons why the media would place such special attention on crime. First, the majority of the public's general understanding of crime comes from the media, making it continually important for the media to produce more cases of crime. In fact, it has been reported that mass media accounts for 95% of the general public's source for information on crime (Schildkraut, 2012). This is supported by the widely held misconception that crime is interracial, due to the overwhelming focus by the media of "black on white" or "white on black" crime. The overall prevalence of crime depicted by the media has less to do with actual statistics and more to do with what makes for a good story. Violent crimes tend to take up more than 40% of crime stories despite the fact that they are the least common (Schildkraut, 2012). In this way the media holds the power to create the public's knowledge or understanding of crime.

Secondly, the media has the power to use crime reporting as a tool for swaying public opinion, since it is so closely relied upon. Not only does public interest propel the selection of news stories, but

it also possesses the power to influence policy decisions (Schildkraut, 2012). For example, if ABC news produces a story on a child who became a victim of sexual assault by a stranger, the public's reaction will be both predictable and uninformed. Not only has the news station succeeded in capturing the attention of the public with a rare incident of a sex crime, but they will have framed it in a way that will lead the public to demand a swift response from the criminal justice system so these "prevalent" crimes can be prevented in the future. The demand will most likely be met by local legislators writing up a bill that does little in the way of responding to the central issues of sex crimes. Instead the bill will focus on creating harsher penalties for unlikely offenders and, due to the lack of attention paid to empirical data on sex crimes, will be unsuccessful in actually preventing crime (Wright, 2014).

Finally, the media is able to create an unbalanced understanding of crime by presenting "a world of crime and justice that is not found in reality" (Schildkraut, 2012 p.176). Past research has found that victims' race and gender statuses shape crime news story decision-making (Gruenewald, 2013). As previously mentioned, mass media accounts of crime drive misconceptions about the prevalence and nature of crime as it occurs within communities across the United States. Allowing victims' and offenders' characteristics to drive newsworthiness not only makes the selection process arbitrary, but it also supports racial stereotypes and racial tensions in the United States.

Scholars have identified numerous motivations for the media to selectively portray African Americans as offenders more often than as victims. In fact, one study by Gruenewald et al found that racial-ethnic minorities are more likely to appear as crime suspects than victims, and that black crime participants are more likely to be linked to violence and danger in television nightly news compared to whites (Gruenewald, 2013). There is a general lack of information about successful African Americans whose contributions to society are great (Bing III, 2010). The distorted image of African Americans taints the view of black culture and fuels misinformation and racial tensions. This negative frame of African Americans falls in line with Bonilla-

Silva's argument that whites have developed powerful explanations, which have ultimately become justifications for contemporary racial inequality that exculpate them from any responsibility for the status of people of color (Bonilla-Silva, 2014). Whites easily rationalize African Americans' perceived lack of successes as a product of market dynamics, naturally occurring phenomena, or their "cultural limitations" (Bonilla-Silva, 2014).

### **Consequences of Disproportionate Representation**

Having control over framing situations gives the media the power to put any given situation in perspective for the general public by sticking to only one narrative of the events. Some scholars speculate that this is to maintain discriminatory mindsets and practices to keep white social and economic privilege intact. This argument also asserts that these narratives support racist stereotypes, and construct scenarios where white fear and anti-black violence are justified. "Mass media representations of black and white criminals and black and white victims gave new life to forms of institutionalized racism and reinvigorated an array of racist narrative practices that had lain dormant for a decade" (Stabile, 2006). Other scholars argue that it is an effort to support a racialized caste system in the United States that not only equates racial minorities with poverty, but also discriminates against them as a result (Alexander, 2011).

Racial tensions in the criminal justice system are largely denied by law enforcement, but the clear overrepresentation of African Americans throughout the criminal justice system argues otherwise. Despite representing only 13% of the total population of the United States, in 2010 African Americans made up 37% of jail populations. In 2009, African Americans represented 30% of those on probation, and 37% of those on parole. Finally, in 2010 blacks represented over 53% of all citywide arrests, where whites represented only 44% (Gabbidon, 2013).

These statistics and racial tensions create a general distrust between African American citizens and police officers. According to the NAACP statistics, 1 in 6 African American men have been incarcerated as of 2001. If current trends continue, 1 in 3 African

American males born today can expect to spend time in prison during his lifetime (NAACP, 2015). Between 2002 and 2011, overall confidence and satisfaction with the police across the country was gauged and recorded based on demographic information. On a scale on 0-100% (100 being completely confident and satisfied) whites reported a range of 60-70% confident, while blacks reported a range of 22-49%. As part of the same survey, individuals who claimed an annual income of \$20,000 or less reported confidence between 43-60%, while those making \$75,000 or more ranged between 65-72% (Gabbidon, 2013 p. 117-118). This disparity in perceived reliability of law enforcement is indicative of differential treatment within any given community based on race or socioeconomic status.

### **Assessing Race in the Media Using Critical Race Theory**

Framing is an important aspect of news coverage because it transforms information into knowledge. Frames are a negotiated product of the competing interests and biases of journalists, government officials, and other political actors (Cook, 1998). Through the lens of critical race theory, it is possible to identify some of those interests and biases as systemic racism. Analyzing the content of news media requires careful and close examination.

A prominent example of explicit racism in the media came from the coverage of the tragic devastation that resulted from Hurricane Katrina in 2005. The framing of the white survivors differed greatly from that of their black counterparts. Much of the coverage focused on the damage caused by the storm and ways survivors sought relief. During this time both white and black survivors were looting destroyed stores in search for medical supplies and food. Media coverage displayed clear discrimination by showing more white victims in a positive light by coupling their images with captions such as "Two residents wade through chest-deep water after finding bread and soda from a local grocery store." In the other images, African Americans are shown in nearly the exact same situation but the caption reads "A young man walks through chest deep flood water after looting a grocery store in New Orleans" (Haider-Markel, 2007 p. 590). Critical Race Theory allows us to identify this frame

as cultural racism. We label the behavior of seeking and taking life-saving supplies as looting because we identify African Americans as thieves and rely on this false stereotype as a means of explaining their behavior, while separating them from whites engaging in the same activities.

Another study examined CNN broadcasts and found that the network broadcast video clips of looting exclusively of African Americans. The news reporting on the crime and violence was later found to be erroneous and exaggerated, although it was easily accepted by viewers (Voorhees, 2007). From a critical race theory perspective, this reflects the use of cultural understandings of race to interpret events (Warren, 2012). Assumptions that link violence and lawlessness to African Americans were reinforced by the repeating images.

The criminalization of the African American evacuees was not the only notable racial undertone found in media coverage of the hurricane. Another study examined media coverage and found that news coverage often engaged in blaming the victims, criticizing the African American residents' failure to evacuate prior to the storm (Warren, 2012). This argument neutralizes other reasons for why the residents were unable to evacuate—lack of resources being a significant reason for why many were unable to evacuate—and instead clings to the notion that they were unable to evacuate due to their “lacking of rationality” or their “inability to act in their own best interest” (Warren, 2012). Here we see Bonilla-Silva's Naturalization frame taking effect, where whites avoid responsibility for racial phenomena by suggesting that the victims were to blame for their “natural” response (Bonilla-Silva, 2014).

Several studies were also conducted in the wake of Katrina, which examined how police and military specifically responded to both the incident and to the media coverage. There were heightened levels of both police and military presence in New Orleans after the storm. One study found that the Department of Defense and other governmental agencies relied heavily on media coverage to inform them of conditions in order to determine proper responses to incidences (Fjord, 2007). The same study found there was a focus

on maintaining social order over humanitarian aid. Implications of the coverage included reduced empathy for evacuees and reinforced prejudices and negative stereotyping of African Americans (Warren, 2012). Much like DeCuir outlined in the 5 tenets of her critical race framework, permanence of racism is preserved through supporting prejudices and stereotypes (DeCuir, 2004).

## Method

To illustrate the impact of framing by the media, I chose to compare and analyze coverage of a single incident of transracial violence. The shooting and killing of Michael Brown, an unarmed African American teenager by white police officer Darren Wilson in Ferguson, MO in August of 2014, dominated media outlets for months. Due to the overwhelming coverage and varying opinions that arose from the death of Michael Brown, I chose to examine not only coverage of the incident, but also of the subsequent protests. I began by creating a database of articles and other forms of media coverage totaling 298 pieces from 9 different media outlets. The media content examined was found entirely using online sources, all of which are available to the public.

I began by collecting articles, videos, and images from national media outlets including NBC, ABC, CNN, and FOX news. I chose to begin with national media outlets because the coverage of the events were well documented and reflected information that the public was likely to have viewed. The number of documents I archived from these four national news providers totaled 91. Of these media sites ABC yielded the fewest number of articles covering the incident, totaling only 6, half of which were interviews with former Ferguson police officer Darren Wilson. NBC, CNN, and FOX alternatively had extensive article and footage coverage ranging from the date of the incident, August 9, 2014, up until the articles were collected over the course of the summer of 2015.

From national media outlets I moved to more local news sources including the New York Times, Washington Post, Wall Street Journal, San Francisco Chronicle, and Atlanta Journal Constitution. These five newspapers provided a significant portion of the total

number of articles collected, 207. Similar to the national media outlets examined, most of the newspapers maintained a timeline of events and coverage of Fergusson ranging from the date of the incident in the summer of 2014 until the time of collection in 2015.

It was important to include both national and local news sources to increase the scope of coverage that was created in the wake of the incident. It was also crucial to the findings of this research that the scope included sources from conservative, centrist, and leftist media outlets. From each of the sources listed above the same method of collection was used. Each site was searched using the same key words and phrases such as “Michael Brown,” “Darren Wilson,” and Fergusson, MO.”

I was also interested in seeing which pieces of the incident reached the most amount of people. To do this, I ran a search on the popular video sharing website, YouTube. I selected the phrase “Michael Brown Fergusson Missouri” to use as a search tool, which yielded just under 10,000 videos. I then sorted the results based on the view count and recorded the video information of the top 20 most viewed videos in my article database. The dates of the videos ranged from August 2014 to July 2015. The view count ranged from 247,180 to 2,952,506 individual views.

It was my goal that by collecting these articles and examining them through a Critical Race lens that I would be able to trace assumptions between the politics and social consequences of media framing. I was particularly interested in what the primary focus of the articles produced by individual sources would reflect. Therefore I went back into my article database and categorized each piece based on the focus of the narrative. Each piece was then labeled with key words and phrases used by the article and used to describe the tone of the article. Words and phrases recorded included murdered, killed, Brown, Wilson, left, neutral, right, protest, riot, protestors, rioters, looters, destruction, peaceful, force, police, national guard, Obama, funeral, community, pepper spray, guns, violence, and justice department. These labels allowed me to have a clearer overview of not only the content of each article but also an insight into which themes dominated each media outlet.

An important distinction to make is the notable difference between rioters and protestors. In the wake of the death of Michael Brown, protestors were identified as those who demonstrated their first amendment rights to freedom of speech and the right to assemble publicly. The rioters alternatively were those responsible for the destruction of property, violence against police and the public, and looting. It is also worth mentioning that many of the rioters who arrived in the wake of Michael Brown’s death came from out of town and had little to do with the protestors’ movement or calls for justice.

## **Findings**

### **National Media Sources**

Of the national media outlets examined there was a clear divide in the overall tone of the articles that coincided with the political background of each outlet. As previously mentioned, ABC News yielded the fewest number of articles and videos (6). For the most part this content leaned toward the left by focusing on issues of civil rights, and the impending consequences of the fatal confrontation. Another notable focal point of their content was how the officer involved, Darren Wilson, seemed unharmed by the incident, identifying the minimal damage done to his body and his complete lack of involvement with the public in the wake of the incident.

The content produced by NBC was possibly the most liberal of all the national sources reviewed. While some of the content remained neutral by objectively reporting on key timeline events such as the autopsy report, the federal investigation, and other civil investigations, much of the content focused primarily on the community and the peaceful protests. Out of 22 articles pulled from NBC’s website, 15 (68%) focused on or mentioned the community and the protests. The overall tone and framing of the protests was supportive. Rather than focus on violence or destruction of property, the site reported on Michael Brown’s funeral, his family, his community, and their cry for justice.

Of the 4 national media sources examined, CNN appeared to be the most neutral in tone and verbiage used. The majority of the

articles were objectively focused on all ongoing investigations, the Justice Department, arrests made, the autopsy report, the grand jury, witness testimony, etc. The use of the word “protest” or “protestor” was used in 10 of the 36 articles collected (28%). The use of the words “riot”, “rioters” or “violence” was found in 12 articles (33%). CNN’s site seemed to produce a balanced view of Ferguson by poking holes in any and all evidence brought to the public’s attention.

FOX News, a right wing conservative media source, focused its coverage around violence, destruction of property, the surveillance tape of Michael Brown stealing cigars from a convenience store prior to the incident, and surprisingly President Obama. Out of the 4 national media outlets I examined, FOX was the only site to show the surveillance footage of Michael Brown stealing from the convenience store prior to his death. From 28 articles and videos collected, Michael Brown was referred to as a thief, a thug, a gangster, and was accused of being a violent person. There was additional discussion from some of these articles about the rap music he listened to, his marijuana use, his history of drinking alcohol under aged, and his supposed status as a “robbery suspect” at the time of his death. One article stated that he stole a \$50 box of cigars, while further research revealed that he grabbed a handful of lose Swisher Sweets, a brand of cigarillos that typically cost \$1 or less a piece.

Another commonly used frame found in many FOX articles was the strong and prevalent opinion that the shooting was justified, and that the aggression toward police in that community was unfounded. In 12 separate articles (43%) FOX correspondents made statements supporting the police’s decisions around the incident. In many of these 12 articles there were authoritative statements made around a lack of evidence and the unlikelihood that Officer Darren Wilson would be indicted well before that decision was passed down. Other oppositional statements to the civil rights activists included content that argued, “hands up don’t shoot” as being a false narrative or a hoax. A final significant finding pulled from the FOX news content was the overwhelming attention paid to President Obama. Many of the articles scrutinized Obama’s response to the incident,

accusing him of picking and choosing which incidences of violence to care about. Additionally, Obama was accused of turning his back of law enforcement, ignoring murders perpetrated by immigrants, jumping on political opportunities in Ferguson, and supporting “phony stories,” false narratives and witness testimonies.

### **Regional Media Sources**

Unlike the national media outlets, the local media sources examined were for the most part objective and unbiased, especially from the New York Times, Washington Post, San Francisco Chronicle, and Atlanta Journal Constitution. Overall, the tone of the coverage was sympathetic toward the community of Ferguson. Much of the coverage focused on Michael Brown’s funeral, the schools, the witnesses, and the community’s involvement with both the protestors and the rioters. Many of the local media sources made a clear distinction between “protestors” and “rioters” which allowed the public to separate the destruction caused by the rioters and looters from the demonstrations and calls for justice by the protestors.

The Wall Street Journal’s coverage of Ferguson stood apart from the other local newspapers as it focused almost entirely on the businesses affected by the destruction. From their website, I recovered only 14 articles which referenced either Michael Brown or Ferguson, MO. In these 14 articles there was no mention of protestors or demonstrators, only of violent rioters, looters, and opportunists. The topics covered included possible legislation reform in local court fines and fees, damages done to the city, and new police policies and practices in the wake of the incident.

### **YouTube**

The most watched videos on YouTube yielded a fairly split list of results. While some of the videos were posted by official media outlets (one by CNN, one by FOX, others by smaller media organizations) many of the videos were produced by unaffiliated individuals. Out of the 20 videos, 9 of them were strictly opinionated pieces about the evidence and the investigation. While the content seemed to split evenly along polarized lines, the footage was extreme.

The most viewed videos contained footage of Michael Brown's body lying in the street, footage of the police responding to the scene of the incident recording residences' reactions, the surveillance video, and raw footage of looters destroying cars, business, and interactions with police. Two of the videos showed police standing by while rioters destroyed property. The surveillance tape was shown in 5 of the 20 videos. Surprisingly, there was more footage of witness accounts and reactions than there was of any protesting or rioting.

One of the most disturbing findings of the video content analysis was how popular some of the opinion pieces were. It became evident to me while viewing that some of the facts being presented to the viewers by the many "political crusaders" online were untrue, exaggerated, or had changed since the posting of the video. Even still, comments were being left in support of the inaccurate information. While official news reporting outlets are required to uphold a certain level of standards in the information they produce, there are no such requirements on the information shared between individuals online, regardless of how many millions it may reach.

## **Discussion**

Due to time and access limitations, only web media was collected and reviewed. This method of searching and locating articles proved to be advantageous, allowing collected data to be neatly categorized as links in an electronic spreadsheet based on key search phrases. Using these key phrases made it easy to quickly identify certain framing techniques being used across articles and across media outlets. The importance of identifying these frames was the first step in understanding how the media was able to manipulate public perceptions to fit into these pre-determined stances.

The death of Michael Brown was perhaps the most prominent crime related event occurring in 2014, and the coverage dominated all media outlets for months. President Obama spoke out about how tragic Brown's death was, but warned communities to protest peacefully: "There is undoubtedly going to be some form of negative reaction and it will make for good TV, throwing bottles or smashing cars will not solve the underlying mistrust and genuine

problems still facing African Americans" (Swaine, 2014).

The attack on Michael Brown's character was perhaps the most egregious move taken by media outlets. Without giving any time for his family or community to sufficiently grieve their loss, the Ferguson police department released footage of Brown stealing cigars from a convenience store to local and national media. Rather than focus on his age, his ambitions, and his ties to the community, television and online media began screening the footage and, just as quickly, much of the public wrote him off as another thug who was undeserving of their sympathies. Rather than focus on the way this young man's body was left in the street for hours, the public focused on pictures of him looking like the stereotypical thug they wanted to believe he was, so that his killing could be more easily justifiable.

While print news focused on the investigation and new developments of law enforcement, online and social media sources continued to produce violent images of looters and militarized police forces aggressively pushing back crowds. The events surrounding the crowds and "protestors" soon became the focal point of media attention. The nation watched as the media aided in creating an "us vs. them" scenario between the people and law enforcement.

As previously mentioned, the public is quick to scrutinize victims of violent crime. In order for most people to offer their sympathies or attention to a victim, they must feel that the victim is deserving of it. The portrayal of victims by the media is instrumental in forming those perspectives by the public. Typically, younger white female victims are the most likely to receive media attention as well as public sympathies, while adult African American males are among the least likely (Stabile, 2006).

## **Conclusion**

Central to this paper is the idea that narratives are formed based on how information is presented. The use of language and frames has the power to create an intended perception of an event or belief. Critical Race Theory contends that it is in the best interest of a dominant race to maintain a separation socially and formally from minority groups. Using this tenet of Critical Race Theory, among



others outlined in this paper, I have drawn 3 central conclusions from my media content analysis. The first is that the most powerful media outlets focused on specific language and frames to create polarizing narratives around race, while distracting attention from other extremely complicated questions that arose in the wake of Michael Brown's death.

One of the first observations I made when I came in contact with coverage of the incident was the language used to separate the two parties involved in the shooting; a "black teenager" was fatally shot by a "white police officer." Additionally, the words "protestors" and "rioters" were deliberately used, sometimes interchangeably, to describe the individuals present in Ferguson in the wake of Brown's death. The yearlong coverage that followed revealed strong images of angry African Americans pinned against a militarized and predominantly white police force. Only two questions seemed to matter to media; was the shooting of an unarmed black teenager by a white police officer justified? And, was this incident racially motivated? The answers to these questions seemed to be answered in tandem by the Justice Department's investigation report, which found that the shooting was justified.

Once these questions were answered in a manner that seemed satisfactory to much of the public, the vandalism, destruction of property, and looting of businesses became the next focus of the media's attention. The public watched an exchange of rocks, Molotov cocktails, smoke bombs, and pepper spray being hurled over racial lines. Ferguson became a site of violence and as quickly as activists arrived to demonstrate their frustrations peacefully, a narrative of aggression, violence, and lawlessness was produced.

While this narrative of anger, hate, and violence took hold of the incident, other questions remained largely untouched by news reporters. In my content analysis, I found that many of my own questions remained unanswered or all together untouched. One of the few that I did find in a small number of articles inquired as to the presence of racial tensions in Ferguson and surrounding communities prior to the death of Brown. However, there was no discussion of why residents were so hurt, so angry, so

frustrated. There was no discussion of the effects of strain, social disorganization, or labeling on a community, and how academic disciplines such as crime theory or critical race theory might be used to examine and validate those feelings. Rather than present questions that seek to highlight systematic reasons why the unrest exploded in the way that it did, the media presented the unrest in frames that guided the public's perceptions into one of two narratives. As the opposing narratives received more attention and support, additional factors and explanations were lost.

The second conclusion reached by this study is the media's use of language and frames to perpetuate racial tensions while denying responsibility. This was most evident by those sources who painted a negative image of Brown after he was shot. As previously mentioned, African Americans are more likely to be depicted as offenders than they are as victims in the media (Gruenewald, 2013). While some media outlets released photos of Brown in his graduation cap and gown, others released the surveillance tape of him stealing cigars. By shifting the focus of the investigation onto Brown's criminal history, the rap music he listened to, and associating words such as "thug," "brute," and "violent man" with him, many began to form the narrative that he precipitated his death by failing to carry himself as an outstanding citizen. It should be noted that from the present study this narrative was most prevalent from right-wing media outlets.

Similarly to the defamation of Michael Brown's character as a means of shifting blame, the focus on the looters and rioters amongst the protests in Ferguson allowed the media to pin the violent reactions to the incident entirely on African Americans. The narrowed frame of chaos and destruction from the small set of rioters distracted from real and prevalent issues of oppression, inequality, and disenfranchisement. Had these issues been highlighted, there would have been a greater call for society to take accountability for the social unrest. Instead, any real issues of race were minimized or naturalized by the media, much like Bonilla-Silva outlined in his book, *Racism without Racists*.

The final conclusion that can be drawn from this research

is that there is an overall lack of accountability taken for racism as it exists in America today. As a producer of knowledge and perceptions, the media must take its responsibility for creating accurate, balanced, and unbiased coverage of events seriously. As consumers, we must take on the task of receiving, filtering, and understanding news equally as serious. If we are ever to eradicate racism from our social institutions, we must be readily willing to understand and accept responsibility for the many subtle forms racism takes. We must hold our formal institutions responsible to the highest level of confronting racism. Only when every member of society is ready to accept responsibility for the existence and perpetuation of systematic racism, can we achieve the equality so many have sought for generations. The powers that seek to maintain racial dominance in this country will cease to hold the incredible influence over social processes of racialization only when true equality becomes the goal of our society.

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## About the Author

Megan Allen is a graduating senior majoring in Criminal Justice with a concentration in Victimology. Her research project was completed in the fall of 2015 under the mentorship of Dr. Wendy Wright (Criminal Justice). Megan presented this research on a panel at the Northeastern Political Science Conference in Philadelphia, PA in November 2015, which was made possible with funding provided by Bridgewater State's Undergraduate Research Conference Travel Grant. The project was part of her Honors Senior Thesis completed in the spring of 2016. Megan currently works with a nonprofit organization as a court advocate for victims of domestic and sexual violence and plans to pursue a master's degree in the fall of 2016.

# Determining the Efficiency of Disposable Baby Diapers through Data Envelopment Analysis

JOSEPH BAKER AND JENNA BERNASCONI

## Abstract

Following the patent of the disposable diaper in the late 1940s, the popularity of the disposable diaper drastically increased. Various companies, including Johnson & Johnson and Proctor & Gamble, continuously compete with each other to create the “best” disposable diaper product. This project compares 12 of the most popular brands of disposable diapers to determine the efficiency of each diaper and what changes could be made to increase efficiency, when applicable.

## Introduction

Parenting involves countless decisions and challenges. What type of clothing? What type of bottle? What type of pacifier? Should I use cloth or disposable diapers? Once the basic decisions are made, the parent still must choose between specific brands. Valerie Hunter Gordon invented the first disposable diaper in 1949 (Gordon, 1951; Paddi Patents, n.d.). Johnson & Johnson then introduced disposable diapers, commercially, in the US around 1949. Soon other companies entered the market, including the popular Pampers brand in 1961 (Butler & Gilson, 2007). Since then, the use of disposable diapers has increased drastically. It is estimated that 90-95% of diapers used in developed countries are disposable (Odio and Friedlander, 2000).

Data from Europe indicates diapers are changed on average 4-5 times a day (UK Environment Agency 2005). The design of the disposable diaper has also changed over the years, as companies try to improve upon various aspects, such as super absorbency and comfort.

The average baby will go through an estimated 6,930 diapers in his or her life (Trustyz, n.d.). In the US alone, it is estimated that 27.4 billion disposable diapers are consumed every year (Real Diaper Association 2014). This raises the question of which diaper provides the most value to consumers. The purpose of this project is to compare 12 of the most popular diaper brands by assigning weighted measurements to each category and determining the efficiency of each disposable diaper. What can be improved and which brand should consumers purchase to best meet their needs? Are store brands any better or worse, or are they the same as name brands? This will all be revealed through the Data Envelopment Analysis. Lab testing and feedback from parents during trial periods of 3+ months concentrating on the variables of price per diaper, absorption, leakage, comfort, health, and durability were used as the primary focus.

## Literature Review

With the exception of a report done by Consumer Reports in 1975 comparing different disposable diaper brands (O'Mara, 2014), there has been almost no recent comparative analysis, regarding disposable diapers, to allow consumers to assess which brand is best. The original 1975 report not only compared diaper effectiveness, but also focused on the cutting down of trees required for the manufacture of disposable diapers. The study included the risk and association of viruses that had been found in feces contained within disposable diapers found in “sanitary” landfills (Mothering, 2014). A result of this study was that the majority of published papers focused on the environmental impact of disposable diapers. In 1979, Dr. F. Weiner, a pediatrician, published a case study that indicated how disposable diaper use causes more severe and frequent diaper rash (Weiner, 1979). These findings and publications set the tone for the majority of papers published on diapers from that point on. Studies

have been done to optimize diaper design to ensure overall child safety and comfort (Lane, Rehder, & Helm, 1990; Zimmer, Lawson, & Calvert, 1986). Even more recent studies have continued to focus on the diaper design (Satsumoto & Havenith, 2010), safety (Evans, Helmes, Kirsch, & Ruble, 2014; Kosemund et al., 2009), health impact on the child (Akin et al., 2008; Mirabella, Castellani, & Sala, 2013), and impact on adolescent development (Cole, Lingeman, & Adolph, 2012).

There have been a select few studies and articles regarding diaper comparison that are from valid sources, such as Consumer Reports (Consumer Reports 2016; Consumer Reports 2004) and one scientific study involving an in depth diaper comparison (Davis, Leyden, Grove, and Raynor, 1989). There are also many websites that allow parents to leave comments on diapers and their efficiency; however, these comments and remarks are subjective and not scientific in nature (e.g. amazon). To our knowledge, there have been no academic or research publications that have examined the value and efficiency of baby diapers in an objective manner. The DEA model has been used to assist with consumer selection of products, but no such analysis has been done on disposable diaper brands.

### Methodology

This study used Data Envelopment Analysis (DEA), a non-parametric approach proposed by Charnes, Cooper, and Rhodes (1978). This model has been used to help consumers compare and select products. The application of the DEA model has been used for smartphones (Mustafa and Peaw, 2005), automobiles (Papahristoudoulou, 1997), and computers (McMullen and Tarasewich, 2000). Despite the popular use of the DEA model for assistance with consumer selection, to our knowledge there are no academic or research publications using this model to assist in selecting baby diapers.

DEA is used to measure efficiency of decision-making units (DMUs) in situations with multiple input and output variables. The DMUs used for this study were 12 popular disposable baby diaper brands. We used the price per diaper as the input variable, and

output variables were 5 diaper qualities important to consumers and ranked on a scale of 1-10, 10 being the highest rated. These qualities were: absorption, leakage, comfort, health, and durability. The outcome of DEA is an efficiency ratio, which indicates the quality with respect to the cost of each diaper brand and compared to the other brands. The measure of efficiency of a DMU is defined as the ratio of a weighted sum of outputs to a weighted sum of inputs. The DEA model through linear programming reveals the areas in which brands can improve to increase their efficiency. This study focused on maximizing efficiency using the following formulas (Charnes et al. 1978):

**Objective Function:**

$$E_r = \frac{\sum_{i=1}^M u_i O_{ir}}{\sum_{j=1}^N v_j I_{jr}} = \frac{u_1 O_{1r} + u_2 O_{2r} + \dots + u_M O_{Mr}}{v_1 I_{1r} + v_2 I_{2r} + \dots + v_N I_{Nr}}$$

**Subject To:**

$$\frac{\sum_{m=1}^M u_m O_{mg}}{\sum_{n=1}^N v_n I_{ng}} = \frac{u_1 O_{1g} + u_2 O_{2g} + \dots + u_M O_{Mg}}{v_1 I_{1g} + v_2 I_{2g} + \dots + v_N I_{Ng}}$$

Symbol	Representing
$E_r$	Efficiency of the rth DMU
$O_{ir}$	The ith output dimension for the rth DMU
$u_i$	The weight for the ith output dimension
$I_{jr}$	The jth input dimension for the rth DMU
$V_j$	The weight for the jth input dimension
$O_{ig}$	The ith output dimension for the gth DMU
$I_{jg}$	The jth input dimension for the gth DMU
$i$	The index for output dimension
$j$	The index for input dimension
$r$	The target DMU
$g$	The gth DMU, =1...G

The above formulas need to be changed to linear functions when using standard linear programming software. To achieve this, the weighted inputs for the DMU need to be scaled to a sum of 1.

**Objective Function:**

$$\text{Max } E_r = u_1 O_{1r} + u_2 O_{2r} + \dots + u_M O_{Mr}$$

**Subject to:**

$$v_1 I_{1r} + v_2 I_{2r} + \dots + v_N I_{Nr} = 1$$

**DMU Constraints Reformulated:**

$$(u_1 O_{1g} + u_2 O_{2g} + \dots + u_M O_{Mg}) - (v_1 I_{1g} + v_2 I_{2g} + \dots + v_N I_{Ng}) \leq 0$$

$g = 1, 2, \dots, G$

Where:  $u_j \geq 0 \quad j = 1, 2, \dots, M$

$v_i \geq 0 \quad i = 1, 2, \dots, N$

The linear formulation of the problems would be:

## Input and Output Analysis

### Input Variable

Price: Diapers were purchased in bulk at common retail stores and cost was broken down into price per diaper.

### Output Variables

Absorption: Testing was done through parental observations and lab testing. The total weight of liquid that could be absorbed into the inner core of the diaper, while keeping the inner surface of the diaper dry was used as a measure of absorbency. The inner surface is defined as the portion of the diaper closest to the baby's skin. The inner core is the portion of the diaper below the inner surface where moisture is drawn away from the baby's skin (Spurrier, 2015b).

Leakage: Leakage was tested by using both parental feedback as well as laboratory testing, to determine at what point liquid leaked from the diaper (Spurrier, 2015b).

Comfort: The placement of the diaper tabs was used as

a measurement of potential comfort. In addition, parents provided feedback regarding marks on the skin that were attributed to diaper usage (Spurrier, 2015b).

Health: Ratings were based on the materials and added chemicals used to make up the diaper, and the potential effects on the baby's health. The lab focused on diaper construction based on dye, chlorine, latex, and perfume. In addition, biodegradability was considered for eco-friendly disposability (Spurrier, 2015b).

Durability: Leg and back elastic quality were assessed to determine durability rating, along with overall construction. Lab testing was done through stretching and the addition of liquids to evaluate diaper durability (Spurrier, 2015b).

## DMUs

Twelve different diapers were used as the decision-making units (DMUs): (1) Pampers: Swaddlers Sensitive, (2) Pampers: Swaddlers, (3) Cuties, (4) Huggies: Little Snugglers, (5) Huggies: Snug & Dry, (6) Huggies: Pure & Natural, (7) Target Brand: Up & Up, (8) Fisher-Price: Happy Days, (9) Luvs: Ultra Leakguards, (10) Walmart Brand: White Cloud, (11) Walmart Brand: Parent's Choice, and (12) Babies R Us: Supreme.

## Data

Data was provided by BabyGearLab, which claims to be the "world's best source of baby product comparison information," (Spurrier, 2015a). BabyGearLab was founded by Juliet Spurrier, MD, a board certified pediatrician with a medical degree from Georgetown University. The intended purpose of the lab is to perform side-by-side comparisons of baby products to help consumers choose the best brand, according to their needs. The lab is not affiliated with any particular corporation or brand, which gives them a non-biased view. The website states "We pride ourselves on simply reporting our findings in an accurate and objective manner without bias," (Spurrier, 2015b).

The testing process began with selection of the top disposable baby diapers for each category. Diapers were purchased

at a retail store and tested across a variety of categories both in lab and in field-testing. Field-testing was done by volunteer parents who used the products and provided feedback over a 3+ month period. In addition, rigorous lab testing was performed across the following categories: absorbency, leakage, comfort, health, durability, and price. Results were then rated on a scale of 1-10, with 10 being the best possible score. All the data are recorded in the Table 1.

## Results

According to our results in Table 2, DMUs receiving an efficiency ratio of “1” are considered efficient; while an efficiency ratio less than “1” indicates DMU’s that are not efficient. Therefore, Cuties, Huggies Snug & Dry, Up & Up, White Cloud, Parents Choice, and Babies R Us Supreme can be considered efficient while Pampers Swaddlers Sensitive, Pampers Swaddlers, Huggies Little Snugglers, Huggies Pure & Natural, Fisher-Price Happy Days, and Luvs Ultra Leakguards are not efficient. These results indicate that customers should choose from product with an efficient rating. This research can help consumers narrow down their selections in accordance with their budgets and preferences.

Shadow price from DEA analysis can indicate the best way to improve the efficiency of inefficient DMUs by referring to the efficient ones. Using the results from the Table 2, manufacturers of diaper can improve the design of the diapers correspondingly.

By comparing the input/output variables in Table 1 to the Efficiency Recommendations in Table 3, it can be seen where each brand can improve. For example, to become efficient, Pampers Swaddlers Sensitive would need to drop the price per diaper to \$0.32 (from \$0.35 as indicated in Table 1). This brand would also need to increase ratings in comfort, health, and durability to the following values 8.4, 4.3, 6.6 respectively. Pampers Swaddlers need to drop the price to \$0.31, increase comfort to receive a rating of at least 6.4, and increase health at least 1.8. To become efficient, Huggies Little Snugglers needs to lower the cost (to \$0.20), while increasing absorption (4.1), leakage (6.0), and health (4.3). To increase efficiency, Huggies Pure and Natural needs to drop the price to \$0.21, as well as increase

leakage and durability (4.3 and 6.7 respectively). Fisher Price Happy Days would need to drop the price per diaper to \$0.20, and increase ratings of comfort (5.5), health (2.9), and durability (4.3). Luvs Ultra Leakguards needs to increase leakage (3.0) and comfort (4.2) ratings, while decreasing the price to \$0.17. Efficiency of each brand is summarized in Table 4.

## Conclusions

For parents with newborn children, the task of choosing which products are best for their babies, but are also cost effective, can be daunting. Baby diapers are no exception. The amount of money spent on diapers in a baby’s lifetime can be substantial, for example 7000 diapers at 20 cents per diaper equals \$1,400. Consumers want to make sure they are getting the best product for their money. Through this study, consumers can see which products to choose in accordance with what is most important to them. From a manufacturing point of view, the DEA model can prove helpful when figuring out where to concentrate efforts for improvement regarding product efficiency.

Based on the results, the following six disposable diaper brands have the best qualities in respect to their price: Cuties, Huggies Snug & Dry, Up & Up, White Cloud, Parents Choice, Babies R Us Supreme. An important observation is that four of the six brands are store brands. However, just because a brand is efficient at its current price, does not mean it has the best ranking in the quality most important to the consumer.

There are a number of limitations to this study. Comfort was assessed based on tab placement, which is not a direct reflection of how the diaper feels to a child. Children of diaper wearing age are unable to verbalize their level of comfort, and therefore the measure of this variable will never be truly objective. Furthermore, lab testing was done by only one lab; while the lab claims to not have any bias, increasing data to incorporate testing from more labs would base the results more robust and unbiased. Lastly, there are other categories that this study did not include, but may be important for a consumer. With current focus on the environment, sustainability and eco-friendly options are increasing. Future studies should be done either

to focus solely on “green” diaper products; sustainability should be incorporated as an output variable.

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**Table 1: Input/Output Variables**

DMU		v1	u1	u2	u3	u4	u5
		Input (in dollars) Price per Diaper	Outputs (out of possible 10) Absorption	Leakage	Comfort	Health	Durability
1	Pampers Swaddlers Sensitive	0.35	8	6	4	1	6
2	Pampers Swaddlers	0.33	8	4	4	1	7
3	Cuties	0.24	6	4	6	1	8
4	Huggies Little Snugglers	0.3	4	5	7	1	7
5	Huggies Snug & Dry	0.26	7	2	4	1	4
6	Huggies Pure & Natural	0.36	5	3	6	2	3
7	Up & Up (Target)	0.14	3	5	6	4	4
8	Fisher-Price Happy Days	0.24	5	4	4	2	4
9	Luvs Ultra Leakguards	0.2	4	3	4	1	6
10	White Cloud (Walmart)	0.17	3	2	8	2	3
11	Parent's Choice (Walmart)	0.17	3	3	3	1	8
12	Babies R Us Supreme	0.19	1	2	4	3	8

**Table 2: Linear Programming Results**

	DMU1	DMU2	DMU3	DMU4	DMU5	DMU6	DMU7	DMU8	DMU9	DMU10	DMU11	DMU12
Obj	0.922167488	0.938131313	1	0.674074074	1	0.574074074	1	0.847701149	0.848809524	1	1	1
v1	2.857142857	3.03030303	4.166666667	3.333333333	3.846153846	2.777777778	7.142857143	4.166666667	5	5.882352941	5.882352941	5.263157895
u1	0.100492611	0.106060606	0.145833333	0	0.142857143	0.092592593	0	0.146551724	0.116666667	0	0	0
u2	0.019704433	0.02020202	0	0	0	0	0	0.028735632	0	0	0	0
u3	0	0	0	0.040740741	0	0.018518519	0	0	0	0.125	0	0
u4	0	0	0	0	0	0	0.25	0	0.028571429	0	0	0.052631579
u5	0	0.001262626	0.015625	0.055555556	0	0	0	0	0.058928571	0	0.125	0.105263158
const0	0.922167488	0.938131313	1	0.674074074	1	0.574074074	1	0.847701149	0.848809524	1	1	1
const1	0	0	0	0	0	0	0	0	0	0	0	0
const2	0	0	0	0	0	0	0	0	0	0	0	0
const3	0	0.447916667	1	0	0	0.666666667	0	0	0.547619048	0	0	0
const4	0	0	0	0	0	0	0	0	0	0	0	0
const5	0.75862069	0.6875	0	0	1	0	0	0.448275862	0	0	0	0
const6	0	0	0	0	0	0	0	0	0	0	0	0
const7	0.896551724	0.166666667	0	0.972222222	0	0.333333333	1	0.620689655	0.071428571	0	0	0
const8	0	0	0	0	0	0	0	0	0	0	0	0
const9	0	0	0	0	0	0	0	0	0	0	0	0
const10	0	0	0	0	0	0	0	0	0	1	0	0
const11	0	0	0	0.388888889	0	0	0	0	0.166666667	0	1	0
const12	0	0	0	0	0	0	0	0	0	0	0	1

Table 3: Efficiency and Recommendations

		Price per Diaper (in dollars)	Absorption	Leakage	Comfort	Health	Durability
DMU1	Pampers Swaddlers Sensitive	0.32	8.0	6.0	8.4	4.3	6.6
DMU2	Pampers Swaddlers	0.31	8.0	4.0	6.4	1.8	7.0
DMU3	Cuties	0.24	6.0	4.0	6.0	1.0	8.0
DMU4	Huggies Little Snugglers	0.20	4.1	6.0	7.0	4.3	7.0
DMU5	Huggies Snug & Dry	0.26	7.0	2.0	4.0	1.0	4.0
DMU6	Huggies Pure & Natural	0.21	5.0	4.3	6.0	2.0	6.7
DMU7	Up & Up (Target)	0.14	3.0	5.0	6.0	4.0	4.0
DMU8	Fisher-Price Happy Days	0.20	5.0	4.0	5.5	2.9	4.3
DMU9	Luvs Ultra Leakguards	0.17	4.0	3.0	4.2	1.0	6.0
DMU10	White Cloud (Walmart)	0.17	3.0	2.0	8.0	2.0	3.0
DMU11	Parent's Choice (Walmart)	0.17	3.0	3.0	3.0	1.0	8.0
DMU12	Babies R Us Supreme	0.19	1.0	2.0	4.0	3.0	8.0

Efficient: DMU3 (Cuties), DMU5 (Huggies Snug & Dry), DMU7 (Up & Up), DMU10 (White Cloud), DMU11 (Parents Choice), DMU12 (Babies R Us Supreme)

Not Efficient: DMU1 (Pampers Swaddlers Sensitive), DMU2 (Pampers Swaddlers), DMU4 (Huggies Little Snugglers), DMU6 (Huggies Pure & Natural), DMU8 (Fisher-Price Happy Days), DMU9 (Luvs Ultra Leakguards)

Pampers Swaddlers Sensitive refer to: Huggies Snug & Dry (0.758620689655172) and Up &Up (0.896551724137931)

Pampers Swaddlers refer to: Cuties (0.447916666666666), Huggies Snug & Dry (0.758620689655172), and Up &Up (0.896551724137931)

Huggies Little Snugglers refer to: Up &Up (0.896551724137931) and Parents Choice (0.388888888888889)

Huggies Pure & Natural refer to: Cuties (0.447916666666666) and Up &Up (0.896551724137931)

Fisher-Price Happy Days refer to: Huggies Snug & Dry (0.758620689655172) and Up &Up (0.896551724137931)

Luvs Ultra Leakage refer to: Cuties (0.447916666666666), Up &Up (0.896551724137931), and Parents Choice (0.388888888888889)

Table 4: Efficiency Summary

Brand	Price per Diaper	Absorption	Leakage	Comfort	Health	Durability
Pampers Swaddlers Sensitive	☹️	👍	👍	☹️	☹️	☹️
Pampers Swaddlers	☹️	👍	👍	☹️	☹️	👍
Cuties	👍	👍	👍	👍	👍	👍
Huggies Little Snugglers	☹️	☹️	☹️	👍	☹️	👍
Huggies Snug & Dry	👍	👍	👍	👍	👍	👍
Huggies Pure & Natural	☹️	👍	☹️	👍	👍	☹️
Up & Up (Target)	👍	👍	👍	👍	👍	👍
Fisher-Price Happy Days	☹️	👍	👍	☹️	☹️	☹️
Luvs Ultra Leakguards	☹️	👍	☹️	☹️	👍	👍
White Cloud (Walmart)	👍	👍	👍	👍	👍	👍
Parent's Choice (Walmart)	👍	👍	👍	👍	👍	👍
Babies R Us Supreme	👍	👍	👍	👍	👍	👍

👍= efficient as is

☹️= needs improvement

# The Man in the Field: Thoreau's 'Concern to Be Observed'

DON BOIVIN

Up among the jagged rocks and cliffs,  
Just west of Erving town,  
There is a noted spot, the Hermit's Cave,  
A place of great renown.

From far and near they come,  
The high, the low, the rich and gay,  
To see this strange and curious man,  
And unto him their homage pay.

Then let us mingle with the crowd  
That daily gathers at his door,  
And learn the reason, if we can,  
Why he calls this world a bore.

Why he shuns the haunts of men,  
And leads a hermits life,  
Never sighs for the innocent prattle of a child,  
Or the gentle ministrations of a wife.

*From The Hermit of Erving Castle, 1871 (J. Smith)*

The term hermit was on the tips of American tongues in the early nineteenth century, likely a result of what the critic Coby Dowdell refers to as “a sustained cultural interest in both male and female hermitic figures during the post-Revolutionary period” (121). Hermits populated poetry, prose, music, and wax museum

exhibits. It's no surprise then that Thoreau, as a result of his two-year experiment confronting “the essential facts of life” at Walden Pond (Thoreau 172), came to be known, both affectionately and resentfully, as the Concord Hermit. The myth persists to this day, despite the indisputable facts surrounding Thoreau's close ties to family, friends, and the Concord community during his stay at Walden, let alone his involvement with the utopian socialist Association movement at Brook Farm and the didactic social motives behind Walden. Emerson himself affectionately referred to his friend as a “hermit and stoic” at Thoreau's funeral. If Emerson had a soft spot for hermits (the Oxford English Dictionary cites Emerson twice under its entry for “hermit”), then his casual reference can be excused, though in the words of critic Walter Harding, the eulogy “had a most devastating effect on [Thoreau's] fame” (22). The sentimental and romantic fascination with hermits was not without literary and historical provenance, but the fact is, it distorted both readers' and critics' expectations, interpretations, and reviews of Thoreau's Walden, thus conceiving and perpetuating an unwarranted myth whose steady course centuries of debating critics have been unable to alter. Thoreau was in no way hiding from the people of Concord, and in fact wanted to be seen and thought about by them. The hermit fallacy, along with its consequent view of Thoreau as a “failure” for associating often with his townspeople, stands only as an obstacle toward a genuine understanding of the true and public quality of Thoreau's model experiment at Walden Pond.

The romantic notion of the wizened old hermit sequestered in a gloomy cave pervaded eighteenth- and nineteenth-century American society. The Massachusetts Hermit, the Pennsylvania Hermit, and the Hermit of Erving Castle were some of the well-known recluses romanticized in narrative form. These works made up a “previously unrecognized American genre” Dowdell calls “the hermit's tale.” “Hermit manuscripts,” he writes, are a “direct legacy of Defoe's unique fashioning of the castaway narrative” in *Robinson Crusoe* (135). The much-besotted cave-dweller of Erving, Massachusetts personifies this ocean-crossing textual unfolding in his claims to have been a “professional hermit” in England.

An article in the Athol Worcester West Chronicle establishes his assertion: "Among the domains of England's nobility, it is customary to have a romantic spot inhabited by a hermit, with long disheveled hair, matted beard, and fingernails like the talons of an eagle, who daily adds additional charms to render the surroundings [sic] more and more picturesque" (J. Smith). If the citizens of Concord and Boston imagined Thoreau to be their very own hermitic curiosity, their fantasies were destined to be disillusioned, as the man had little interest in entertaining another's agenda: "Ne look for entertainment where none was" he quotes (Spenser's *The Fairie Queen*) in the "Visitors" chapter of *Walden* (210).

Originally denoting one who retires to solitude from religious motives, the term hermit has evolved to encompass just about anyone withdrawing into self-imposed solitude ("hermit, n."), though contemporary undertones are of a negative nature; in most of the American hermit narratives, the hermit has been damaged or victimized by a person or group of people (the hermit of Erving suffered the betrayal of his lover, the Pennsylvania hermit saw his sister executed for infanticide) and has shunned convention and propriety in favor of a reclusive life far from the perceived failings of society. "The hermit's backstory represents the main thematic thrust of the hermit's tale, explaining his or her reasons for withdrawal while underscoring the central critique of society that the hermit's actions point to" (Dowdell 131). Herein lies both the refutation of and possibly the source of the myth surrounding Thoreau. Thoreau's soul was not damaged, he was no victim, and he was not living in seclusion; yet *Walden* was most certainly a critique of society, and was born in a hermitage of sorts, or more aptly labeled by the critic Lance Newman, "an experimental community of one" (517).

Thoreau gained the unbecoming title of "hermit" quite early on. In 1849, well before the release of *Walden*, a critical letter in the *New York Daily Tribune*, responding to a favorable piece by Horace Greely on Thoreau's Lecture "Life in the Woods," questions the paper's endorsement of this "Concord Hermit" (Thorough 16). The word "hermit" shows up again and again in early book release notices and reviews. Their content implies not only an unfounded

assumption that Thoreau meant to live as a hermit, but that as such, he was doing a very poor job of it. A *Boston Atlas* review of 1854 stated, "He was no true hermit. He only played savage on the borders of civilization; going back to the quiet town whenever he was unable to supply his civilized wants by his own powers" ("D'A" 32). James Russell Lowell, one of Thoreau's most vehement critics, wrote, "He was forever talking of getting away from the world, but he must be always near enough to it, nay, to the Concord corner of it" (48). Lowell goes on to contrast Thoreau's quarters unfavorably to that of "a genuine solitary who spent his winters one hundred and fifty miles beyond all human communication" (49).

Many of the critics of this vein also "accuse" Thoreau of quitting after two years, implying the author disproved his own theories by not living out his days in the woods. "When he had enough of that kind of life," mocks Robert Louis Stevenson, "he showed the same simplicity in giving it up as in beginning it." (67). Charles Frederick Briggs writes, "He was happy enough to get back among the good people of Concord, we have no doubt; for although he paints his shanty-life in rose-colored tints, we do not believe he liked it, else why not stick to it?" (27). Even his good friend Emerson contributed to the rhetoric: "As soon as he had exhausted the advantages of that solitude, he abandoned it" (26). No doubt, Emerson's eulogy was not meant to undermine the reputation of the man he believed was "born for great enterprise," (38) but Emerson's praise was oblique, accompanied as it was by such comments as "that austerity which made this willing hermit more solitary even than he wished," or "the severity of his ideal," which "interfered to deprive him of a healthy sufficiency of human society" (37). Such are the sentiments that remain in the minds of Americans today.

Richard Smith, a current-day Thoreau impersonator and historian at Walden Pond, complains that the hermit myth is as pervasive as ever, citing one visiting teacher who arrogantly stated, "You know, Thoreau was a hypocrite – he told everyone he was a hermit, but he came home every day to get his laundry done!" (R. Smith). In fact, Thoreau reveals without equivocation in his *Walden* chapter "Visitors" that "every day or two I strolled to the village to hear

some of the gossip” (228). Myths travel widely and quickly through the mouths of non-readers, sans the facts to slow the projectile, but readers and scholars as well, both friend and foe, are as guilty. In John Updike’s “A Sage for all Seasons,” an ambiguous expression of reverence sounds strangely similar to Emerson’s eulogy: “A century and a half after its publication, *Walden* has become such a totem of the back-to-nature, preservationist, anti-business, civil-disobedience mindset, and Thoreau so vivid a protester, so perfect a crank and hermit saint, that the book risks being as revered and unread as the Bible.”

Of course, one can hand-select quotes from *Walden* to disprove these perpetual characterizations of Thoreau as antisocial, hypocritical, and crotchety, but this has been done continually and unsuccessfully for years. As the critic Robert D. Richardson points out, “*Walden* can be cited on both sides of many issues, and rather easily if one’s irony detector is switched off...Individual lines and phrases do not outweigh the serious and long-held charges against him” (237). And besides, proving that Thoreau was a nice guy, a good friend, or a philanthropist won’t contradict the specifications of the “highly formulaic” hermit’s tale, in which “the hermit is invariably hospitable, inviting the travelers into his or her humble dwelling and treating them to a simple (often vegetarian) meal” (Dowdell 130-1). The people want a hermit, they’ve chosen their man, and changing their minds is going to take a wholly new tactic, one that rather than focusing on Thoreau’s actions and words, digs to the heart and purpose of *Walden* and other writings. If the myth is ever to be dispelled, Thoreau’s views on social reform rather than environmental preservation, economy, or self-reliance must become more widely known and understood.

In “Where I Lived, and What I Lived For,” Thoreau makes it quite clear that his motives for writing *Walden* were far from those of the authors of the hermit tales: “I do not propose to write an ode to dejection, but to brag as lustily as chanticleer in the morning, standing on his roost, if only to wake my neighbors up” (168). Besides revealing a clear intention to influence and enlighten his readers, this leads to a question of place, as a rooster crowing

from the depths of the insulated woods would be a most ineffectual alarm. Just how deep “In the Woods” was Thoreau’s rustic abode? Not very, according to the author of “Emerson’s ‘Wyman Lot’: Forgotten Context for Thoreau’s House at Walden,” who discusses the legendary cabin’s site and its social bearing. Maynard cites recent studies that determine Thoreau’s wood would have been “more like a clearcut” and numerous resources that make it clear his house lot was of an “open, sunny character” (Maynard). Thoreau himself corroborates this openness—and proximity to civilization—in “Solitude”: “I have my horizon bounded by woods all to myself; a distant view of the railroad where it touches the pond on the one hand, and of the fence which skirts the woodland road on the other” (201). It is the proximity of this woodland road that comes to bear on Lance Newman’s argument that Thoreau’s *Walden Pond* experiment was most definitely of an intended public nature.

The critic cites passages from “The Bean Fields,” in which Thoreau discusses his “daily work” of cultivating beans in “two acres and a half of upland...the only open and cultivated field for a great distance on either side of the road.” In Thoreau’s mind, travelers on this road see him as a “home-staying, laborious native of the soil” (220-1). Drawing on this and other writings and research, Newman shows how this sentiment attests to Thoreau’s engagement with the ideas and ideals of the ongoing utopian socialist Association movement, whose flagship community was the nearby Brook Farm: “This self-consciousness, this concern to be observed, is no matter of mere pride. It is a sign of his close attention to the central process by which his splendid self-reliance, his moral progress, will inspire those who live off the labor of others to follow his lead” (531). Thoreau was well aware of Brook Farm, had made a sympathetic visit in 1843 (517), and despite his oft-quoted journal comment that hell would be preferable to membership in such communities, was a living manifestation of the principles of the Association movement. In a *Dial* article about Brook Farm, Elizabeth Palmer Peabody writes: “The hours redeemed from labor by community, will not be reapplied to the acquisition of wealth, but to the production of intellectual goods” (Newman 528). This was the goal of the Association, further

elucidated in the words of Brook Farm's founder George Ripley—"to level all upward...the energy now thrown into the brute law of self-preservation, becoming love of God and man" and to "insure a more natural union between intellectual and manual labor" (520-1). Newman points out two possible methods toward achieving this desired balance: to reduce the number of hours devoted to labor, which Brook Farm accomplishes by taking advantage of economies of scale and Thoreau by reducing his needs; and to "transform [labor] into an activity that develops spiritual integrity and character in its own right" (529). Newman's article points out Hawthorne's success in this latter goal at Brook Farm, while Walden in its entirety is testament to Thoreau's. To quote but one passage from "The Bean Fields": "Labor of the hands, even when pursued to the verge of drudgery, is perhaps never the worst form of idleness. It has a constant and imperishable moral, and to the scholar it yields a classic result" (Thoreau 221).

Newman goes on to draw additional parallels between the views of the Association and Thoreau, views on poverty, commerce and its resultant "spiritual inertia" (527), and harmony with nature. He explains that Thoreau's only real disagreement with the Association was its artificiality, that Thoreau's solution to a socially and spiritually bankrupt society begins much closer to home: in one's individual relationship with nature, or in Thoreau's words, through "intelligence with the earth" (Newman 534). Thoreau was a great respecter of "spontaneous organic order" (536), and thus was offended by the prospect of intentional community, but he also understood that nature's fundamental laws were laws of evolution and change—"living poetry," he called it. Newman quotes Thoreau: "And not only [earth], but the institutions upon it are plastic like clay in the hands of the potter" (537). To extend the metaphor in an analogy: in fashioning a vase or a bowl, the artist looks to those vessels currently in existence, and especially to those most functional and beautiful, for inspiration in the creation of his or her own work of art. Thus Thoreau, in his bean field by the side of the road, in his much-visited humble abode over the rise, and ultimately in his "simple and sincere account of his own life" (Thoreau 107), would serve as that inspiration.

So much for the hermit who "calls this world a bore" and "shuns the haunts of men." Unlike the popular hermit's tale, in which "withdrawal itself is a perceptible political gesture" (Dowdell 131), Thoreau, if the world insists on calling him a hermit, was "a very public hermit" (Maynard). "Some must work in fields if only for the sake of tropes and expression, to serve a parable-maker one day," writes Thoreau, lightly mocking his self-imposed appointment as farmer/intellectual/story-teller (224), but clearly revealing his desire to be a living, visible, published, and publicized illustration of a more spiritually enriching and morally sustaining way to live.

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# Sex on the Body: Representation of the Queer Individual in Alison Bechdel's 'Fun Home'

SAMANTHA CORREIA

In the graphic novel *Fun Home*, Alison Bechdel describes her struggle against conforming to societal expectations, at both a familial and cultural level. Her desire to fit in is contrasted by the need to be herself, though she struggles with her identity because it defies the ideology of what is “normal.” She chronicles her life as a lesbian while growing up in a time and household that restricted her from being who she was: an independent queer woman who felt that she did not fit into her feminine body. She writes about her life in her graphic novel, which was turned into a Broadway musical with the same name, written by Lisa Kron. Bechdel’s individual identity is one of a creative artist and gay individual, who faces oppression from her father and from social expectations of women. Through *Fun Home*, Bechdel argues that sex and sexuality, represented on the physical body and shown through the visual and performing arts, allow for people of the queer community to be accepted by the dominant heteronormative society that is prominent in Western cultures.

The innocence of childhood provides a perspective that is free of the knowledge of societal expectations, but this lack of knowledge means that childhood is a time of great confusion for Alison while she is developing physically and mentally. In both the graphic novel and the musical, Alison is able to look back at her own childhood and reflect on the moments leading up to her adulthood. In the musical, each significant stage of Alison’s life is expressed through three different Alisons with three different actresses (see

Figure 1): Small Alison, Medium Alison, and Adult Alison. Alison’s childhood is manifested in the body of Small Alison, which puts emphasis on Alison’s own awareness of her body as a child. Even at a young age, Alison realizes that she is different, from her discomfort in her own body to not wanting to look like other girls her age. In the musical, she expresses her discomfort in her own body in the song “Party Dress,” in which she says that wearing dresses makes her “feel like a clown” (Kron). She feels uncomfortable and ridiculous in feminine clothing. Even at a young age, she uses her body to express herself, even as she was forced to give in to expectations dictated by her father. Through the illustrations and lack of color, the novel gives a dark and somber representation of Alison’s childhood. However, the musical is more vibrant, with visual movement and brighter colors; this difference between the two brings out the vibrancy that is lost as a child grows up into adolescence and faces reality.

A patriarchal society maintains the idea of male domination, mirrored in Alison’s male-dominated home life and the physical and verbal abuse from her father, Bruce. Her father is a symbol of the dominant, oppressive society in which Alison lives. Just like how assimilating into a heteronormative society seems appealing, Alison’s father, Bruce, “appear[s] to be an ideal husband and father” (Bechdel 17). From an outside perspective, everything seems pleasant between him and his family, and he appears to be a good father to Alison. He is trying to be a father in the only way he knows how, by selfishly treating Alison like she is a physical extension of himself, or a do-over of his own childhood. He admits to her that, growing up, he wanted to have a female body, and so he gives Alison the childhood he could never have, with hair bows and dresses. He forces her to dress her body in a feminine way, often through violence and verbal abuse, even though he can see that she does not want to dress “like a girl.” His physical abuse is an attack on Alison’s body and on how Alison wants to express her gender. As a closeted gay man, Bruce lives a double life and does not want Alison to be tortured by a lifestyle she cannot have, so he tries to stop her. But while fitting into society may seem nice and appealing, as many queer individuals have found, it lets the oppressive patriarchal modern society succeed.

Going into hiding by wearing certain clothes, acting a certain way, or living a certain lifestyle causes a separation between the true mind and body, leading to the physical effects of stress and anxiety on an individual.

The ornate Gothic Revival house that serves as the Bechdel family home in *Fun Home* parallels the outward representation and interior true self of the human body. The exterior of a house is what is shown off to neighbors and visitors, but it often hides the interior space of the house and the true nature of the people who live there. Bruce Bechdel has an obsession with fixing the Bechdel family house, a type of control that he also dominates over his family. Alison and her siblings are limited as children because they cannot disturb the museum-like atmosphere of the house. Bruce is obsessed with “the gilt cornices, the marble fireplace, and the crystal chandeliers” (Bechdel 5) that suffocate every space in the Bechdel home. These numerous inanimate objects are all part of his collection, objects that would not move or disrupt his life, and the stillness of these objects suggests the stillness of a mausoleum. In the musical, the props and stage are simple and limited, juxtaposed with the gilded decor of the actual Bechdel home (see Figure 2).

There is a simplicity in the small stage, but in the graphic novel, Bechdel is able to provide a visual representation of what the house really looked like. Alison believes that, for Bruce, “the real object of his affection was his house” (Kron), not his children, nor his wife. His need to control his house symbolizes the need to control his own body, as a closeted gay man living inside the exterior of a heterosexual man. He desires to organize his mind amid the stress of a double life, and by trying to put everything in the house in the right spot, he is trying to make sense of his own mind. The connection between the body and the mind is important when it comes to gay representation, because ideally the body and mind would be unified and connected with each other, something queer individuals often struggle with.

The family unit represents a structured space that can often be entrapping, so leaving home is a process of literal liberation. Alison’s home is ruled by her father; he is a “lowering, malevolent

presence” (Bechdel 197). Her father’s presence is a constant in Alison’s life, suppressing the presence of her differences from others.

*Fun Home* suggests that an oppressive childhood space affects queer adult life by forcing the adult to take the journey of self-discovery through leaving home. If they never leave the family unit, the oppression continues and they can never escape, constantly living a lie of a life. Alison’s home symbolizes a cage, trapping her body into gender roles. She grows up with clearly identified lines of how a man should behave and how a woman should behave, and there is no room for her lesbian lifestyle. However, Alison is able to escape her prison, the sphere of what she calls home, when she leaves for college. Going to college allows her to escape the repression of her father, and she is able to make her own sexual discoveries. She is able to admit to herself who she really is and to come out of hiding.

Violence toward queer individuals makes evident the danger they are in because of their identity. *Fun Home* shows that maintaining one’s queer individuality can be not only difficult, but also very dangerous, often leaving escape as the only option. Alison is eventually able to rebel against the oppressive aspects of her life and create a better life for herself, becoming who she wants to be as an adult. But for many years she finds it difficult to be an independent queer individual because of the inequality in society and fears of the violent backlash and hate crimes queer people experience just for being who they are. Bechdel references the Stonewall riots, a symbol of rebellion in the gay community, as well as of violent backlash against them. As a child, she visits New York City just a few weeks after the Stonewall riots and sees a community radically different from her home life. Her own rebellion that had started in early childhood gets stronger after this eye-opening family trip to New York City, where she feels “a quantum particle of rebellion” (Bechdel 104) in the air. She is revived by that energy, and her true self blossoms even more. It is important that the musical is currently playing on Broadway in New York City; New York has a long history of gay culture, and the *Fun Home* musical is now an important aspect of the queer story in that city. For Alison, resisting the male influence in her life is her own personal rebellion. Rebellion against the heteronormative society in

Western culture is necessary for members of queer communities to get the rights they deserve.

The realization of her own lesbianism is a coming-of-age moment for Alison; the realization of her sexuality comes from both queer literature and sexual interactions. Literature and the arts provide a voice for queer individuals, and Alison realizes her own voice while reading about other queer individuals. Alison first realizes she is a lesbian when she finds at a bookstore a book of gay individuals' stories about coming out. After that first book, she reads as much as she can on homosexuality and queer culture, trying to learn the history and find her place in it. Alison considers her realization "a revelation not of the flesh, but of the mind" (Bechdel 59), indicating that her realization is one of intellect, and that she is trying to analyze herself like a piece of literature. While she is growing up, Alison's father gives her many books for her to read and analyze, though he tells her how she should think about the literature he gives her. Her later experience in the bookstore is her first opportunity to find books for herself, and she quickly learns how to think for herself, a turning point in her life.

While realizing she is a lesbian is a step toward independence and transformation, the actual moment of change for Alison is in her first sexual encounter. In the musical, her adolescent existence is shown in physical form by the character Medium Alison. Having sex is a coming-of-age moment for Medium Alison, portrayed in the song "Changing My Major," in which she describes her first sexual encounter and the impact it has on her. She had told her parents that she is a lesbian before having sex, but having sex defines the word lesbianism in a corporeal way, unifying the written word with the physical world. Alison believes she has "become someone new" (Kron) after her first sexual experience. She is emancipated from her past of repression and is free to live her life as a new individual.

Death is a constant motif throughout Alison's life, as the literal and figurative death of the queer individual is a way to continue the history of repression common in queer culture. When Alison is 19 years old, she receives the news of her father's death. Although his death appears to be an accident, Alison believes it is a suicide

because it had been recently exposed that Bruce is a closeted gay man. Bechdel believes that Bruce was trapped in the family unit, and the only escape he saw, without having to accept himself for who he is, is through death. He gives in to society's mission to eliminate queer individuals and anyone who is deemed different by eliminating himself. Bruce had restrained himself his whole life, never living freely, and is met by his own demise. Alison sees her father's death as "a queer business" because she considers it "suspicious, perhaps even counterfeit" (Bechdel 57), mainly because she thinks it is somehow related to her lesbianism.

Nonetheless, Bruce's death symbolizes the release of Alison from her final cage. Alison is not fazed by her father's death, mainly because she is used to seeing death, having grown up in her family's business, the Bechdel Funeral Home. She sees death as a bodily function—something that happens to everybody. In Alison's experience, death unifies everyone, whether they are gay or straight. The visual aspect of death, namely the body in the casket, is accentuated in both the novel and the musical, allowing the reader or the viewer to visualize the deceased. Alison's reflections suggest, though, that a physical death is not necessary for the annihilation of the individual personality because a life of personal lies and a life in hiding is seen as equivalent to death.

Bruce's life shows the seductive qualities of acclimating to society—drawing people in, allowing the cycle of oppression to continue, and making it very difficult to leave. A life of repression leads to the continuation of repression, often continuing generation after generation through the birth and death of individuals. Alison Bechdel believes that "[her] father's end was [her] beginning" (Bechdel 117). With his death, she is freed from having to repress her feelings. Her birth, the creation of her physical body, had been a beginning for her, but it had been the beginning of the end for her father. Alison and Bruce had become "inversions of one another" (Bechdel 98), representing both the opposites and similarities in each other. They are two sides of the same coin: both gay individuals, but living two totally different lives; both trying to push against "normal" heterosexuality.

The heterosexual lifestyle is a well-known cycle: one grows up, gets married, and has kids, and then those kids will do the same. It is considered the norm, a forced idea that will keep repeating, unless a rebellion changes things. The musical itself takes place in the Circle-in-the-Square Theater, which emphasizes the circular aspect of Bruce's and Alison's lives. In the song "Maps," Adult Alison points out that she "can draw a circle [which his] whole life fit inside" (Kron). Bruce's birth, life, and death are all very close to each other on a map of his hometown. He had been unable to escape the circle that represents society's heteronormative lifestyle and its cycle of oppression.

In our binary society, the struggle to define an individual's gender and sexuality can cause a disconnect between one's body and mind when one finds it impossible to fit into the typical images of masculinity or femininity. The option to escape the binary does not even exist for many; they are only given one option, and that option is the gender given to them at birth. For some, there is shame that comes with realizing they are veering from what is expected. With the abuse that so many queer people face, accepting their sexual and/or gender identity can be a deep personal struggle. But Bechdel's story asserts that it is a struggle well worthwhile—that "sexual shame is in itself a kind of death" (Bechdel 228). The unique individual dies away even if the body might still be living. The body turns into an empty shell, a mask hiding the individual; the body can even be seen as the enemy.

The intense struggle to define one's gender and sexuality is evident in the Bechdel family, where Bruce is feminine and Alison masculine in some aspects. They each represent the varying struggles of queer individuals to define who they are. With the hiding of one's true self, as Bruce shows, comes the eradication of the individual as well as of a vibrant culture. The same kind of eradication could have happened to Alison. She could have been forced into hiding as a straight woman, as even she wonders whether she would have eventually given into a heterosexual marriage. *Fun Home* makes explicit the erasure of lives that occurs when queer people cannot live truthfully.

Art is not only a way to visually represent a person or an idea, but also allows for broader representation—in this case, representation of queer individuals in a society that tries to silent their voices. Bechdel has spent her adult life working as a "lesbian cartoonist" and has made a career out of out of documenting her life and experiences as a queer individual. She says there is something satisfyingly physical about drawing her world and her body how she wants to. She does not hold back in her story, revealing very personal things about her life in *Fun Home*, not wanting any of it to be censored. She reflects back on her earlier life, telling her story from an adult's perspective, expressed through the character of Adult Alison in the musical.

Bechdel's story told as a Broadway musical is the first of its kind. It is the "first mainstream musical about a young lesbian," according to June Thomas in an article about the show for *Slate* magazine. Despite Bechdel's nervousness about how the show would be received by Broadway audiences, the musical won five Tony awards in 2015 (Thomas). Such honors indicate that art has the power to make strides toward equality. When stories like Alison Bechdel's are told, they start to undo the efforts to erase queer people from history and culture. Queer history is often not labeled or identified; although it exists, it is not well-known or accepted. In the musical, Alison receives a letter from her father after her coming out, in which he says he "can't see the point in putting a label" on her sexual orientation (Kron). But labels are ways of naming and defining—valuable ways for queer people to identify themselves and not feel so alone.

Alison Bechdel has become an icon in popular culture who is using her talents and fame to share stories of queer people overcoming oppression and being who they are. Bechdel shows that all individuals must have the right and freedom to express their gender identity and sexuality. She encourages queer individuals to express themselves through sexuality and their bodies, and in doing so, she is rewriting history and creating a path for the future of queer individuals. *Fun Home* suggests that stopping the oppression of queer people requires pushing for equality in social movements, but

also, on a personal level, discovering what makes one unique and accepting differences; the novel and the musical demonstrate the power of claiming one's difference and rebelling against anyone who suggests otherwise.

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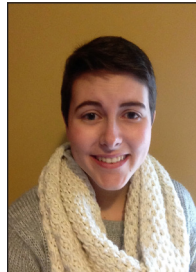
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## About the Author



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# Comparison of Renting Training Aircraft Using Data Envelopment Analysis

HEATHER DICKERSON

## Abstract

Many elements are involved when a pilot is trying to decide which aircraft to pursue for rental. Uninformed new pilots decide to rent purely based upon the aircraft used for initial training, but once more variables are considered, the pilot will realize such an important decision must consider all aspects. Cost typically being the greatest determining factor, horsepower output of the engine, speed, the maximum load capacity, and the maximum altitude the aircraft is able to reach also tend to have a large effect on determining which aircraft will suit the needs of the pilot. Data Envelopment Analysis was used to compare ten of the most common training and rental aircraft to determine which model was most efficient given the constraints listed above. This model can show even the newest pilot which aircraft should be chosen to rent based on a few of the most common variables in flying.

## Introduction

Compared to other modes of transportation, the history of aviation is much more recent, and fast evolving. The constantly progressing journey of developing aircraft successfully began by the Wright Brothers in 1860. They began with small toy sanded aircraft helicopters and by 1899 the Wright brothers began creating an aerodynamic control system for small aircraft. In the early 1900's they developed their first manned glider known as the "kitty hawk"

and patented their aerodynamic control system. In 1903, the Wright Brothers broke records and set the pace for the future with their first ever twelve-second flight (Croche 2015).

Quickly after the Wright Brothers successfully got off the ground and back in one piece, the aviation industry "took off" and it was clear that the pilots needed to be trained to operate such a vehicle. Developers soon realized that pilots would have training that is more effective in aircraft designed for that purpose. Training aircraft has advanced throughout history with many more additional safety features than a typical aircraft (Davisson 1992). The use of sympathetic flight features and a basic cockpit organization allows training pilots to improve their navigation, real-time piloting, and flying abilities without the hazard of straining their abilities alone in a fully featured aircraft. Civilian pilots, specifically, are normally trained in a light aircraft, which is what this research project focuses on. Normally, training aircraft have two to four places for seating to accommodate the certified flight instructor and also the student pilot, as well as an additional person if necessary. These aircraft are adapted to tolerate the flight conditions executed during training flights. These training aircraft are then what an average new private pilot would be seeking to rent after they receive their certificate. In this research, ten of the most common rental aircraft are to be compared (Price 2015):

- Cirrus SR22 - SR22 (2003).
- Cessna 172 model R - C172R (1996).
- Cessna 152 - C152 (1979).
- Piper Warrior - PA 28-161 (1982).
- Diamond Katana - DA 20-C1 (2012).
- Piper Tomahawk - PA 38-112 (1978).
- Piper Arrow - PA 28R-200 (1973).
- Cessna 206 - C206 (1979).
- Mooney - M20J (2005).
- Cessna 182 model Q - C182Q (1979).

When pilots earn their pilot certificate, they have the skills and ability to purchase an aircraft. However, it is very costly to own and maintain a plane, so renting is often the only feasible option. Although there are many ways to compare what aircraft might be the best option, DEA Modeling is used in this paper in order to determine the most efficient choice of rental. In this research project, we are using cost of renting per hour as our input. Horsepower, maximum cruise speed in knots, service ceiling in feet, and maximum takeoff weight in pounds as outputs. Data for each was collected primarily by the Pilot Operating Handbook for each individual aircraft, and, more specifically, by using the performance sheets for each variable.

### Literature Review

Charnes, Cooper, and Rhodes developed data Envelopment Analysis, or DEA. It soon became a popular modeling method is used worldwide to measure the efficiency of decision-making units or DMUs (Charnes 1978).

There are plenty of applications of DEA Modeling that compare efficiency of the commercial side of aviation, for example, Zhu, Lin, Yang, and Chang (2012) discussed managing airline efficiency utilizing resources such as fuel and salaries to maintain fleet size and load factor. Operational performance vs profitability in commercial aviation was compared by Tsiriktsis (2007). However, to our knowledge, it does not appear that any academic research papers using Data Envelopment Analysis has been written to aid in the selection of renting a training aircraft.

### Data Envelopment Analysis Model

DEA can be used for research in evaluating efficiencies of any Decision Making Units (DMUs). Those DMUs could be some business processes such as service, purchasing or production process, which have multiple similar attributes. These attributes would contribute the transformation process to transform inputs (some attributes used/applied) to outputs (some attributes achieved). Below is the basic model.

### Definition of Variables

Let  $E_k$  be the efficiency ratio of unit  $k$ , where  $K$  is the total number of units being evaluated.

Let  $E_e$  be the efficiency of the  $e$ th Decision Making Unit (DMU)

Let  $u_j$ , with  $J=1,2,\dots,M$  be the coefficient for output  $J$ , where  $M$  is the total number of outputs being considered.

Let  $v_i$ , with  $I=1,2,\dots,N$  be the coefficient for input  $I$ , where  $N$  is the total number of inputs being considered.

Let  $O_{jk}$  be the number of observed units of output  $m$  produced by service unit  $k$  during one time period.

Let  $I_{ik}$  be the number of units of inputs  $n$  used by service unit  $k$  during one time period.

### Objective Function

The objective of a DEA is to find a set of coefficient  $u$  associated with each output and a set of coefficient  $v$  associated with each input that will yield the highest possible efficiency for the service unit being evaluated.

In this case  $e$  is the index of the Decision Making Unit

$$(1) \quad \text{Max } E_e = \frac{u_1 O_{1e} + u_2 O_{2e} + \dots + u_M O_{Me}}{v_1 I_{1e} + v_2 I_{2e} + \dots + v_N I_{Ne}}$$

(DMU) being evaluated. The objective function is subject to constraints such that when the same set of input and output coefficients ( $u_j$  and  $v_i$ ) is applied to all other DMUs being compared, no DMU will exceed 100 percent efficiency.

### Constraints

The constraints for which DMUs are held are as follows:

When applying linear programming to these constraints the

objective function is rewritten as follows with the following new constraints:

$$(2) \quad \frac{u_1 O_{1k} + u_2 O_{2k} + \dots + u_M O_{Mk}}{v_1 I_{1k} + v_2 I_{2k} + \dots + v_N I_{Nk}} \leq 1.0 \quad k = 1, 2 \dots K$$

For each service unit the constraints in equation 2 are reformulated in the format seen in equation 5.

### Input and Output Variables Analysis

$$(3) \quad \max E_e = u_1 O_{1e} + u_2 O_{2e} \dots u_M O_{Me}$$

$$(4) \quad \text{Subject to: } v_1 I_{1e} + v_2 I_{2e} + \dots + v_N I_{Ne} =$$

$$(5) \quad u_1 O_{1k} + u_2 O_{2k} + \dots + u_M O_{Mk} - (v_1 I_{1k} + v_2 I_{2k} + \dots + v_N I_{Nk}) \leq 0 \quad k = 1, 2 \dots K$$

This research is comparing what small training aircraft would be the best to choose for renting by comparing many different quantitative values. This can be visually seen in Table 1. The primary and focus input being the cost of rental per hour. Since various flight schools offer different rates throughout the United States, the input was a calculation of all available prices throughout the country added together and averaged for each of the ten aircraft (Archer 2015). Some rental agreements offer pricing without fuel, but since the majority of rental agreements are fuel inclusive, data was only taken from fuel inclusive agreements. Each input cost is rental price per hour.

The outputs used in this research include:

- Horsepower, which is the power of the engine output measured in units per amount of time.
- Maximum cruise speed in knots, which is the fastest the aircraft is able to travel in smooth air.
- Service Ceiling in feet, which is the highest altitude the aircraft is able to fly.
- Maximum takeoff weight in pounds, which is how much

weight the aircraft can safely fly at above its standard empty weight.

This research collected data directly from that aircrafts Pilot Operating Handbook. All of the output variables are readily available and easy to find in the Pilot Operating Handbook. Horsepower is a straightforward number located within the “general” section of each Operating Handbook. Maximum cruise speed, service ceiling and maximum takeoff weight for all aircraft are all given numbers and cannot change. When an aircraft is produced, it goes through rigorous testing in order for the manufacturer to provide a buyer or renter with the information in the Operating Handbook. Data Table 1 contains all information in basic format to show the values of inputs and outputs for all DMUs.

### Results

Out of the ten training aircraft compared in this DEA Model, two were found to be efficient. Within table 2, it can be seen for each objective value of 1.00, that aircraft was efficient. The Piper Tomahawk and Cessna 206 were both efficient. The DMUs with the objective value less than 1.00 are not efficient. Therefore, the remaining eight were not efficient. The eight aircraft were Cirrus SR22, Cessna 152, Cessna 172R, Piper Warrior, Diamond Katana, Piper Arrow, Mooney, and Cessna 182Q.

### Recommended Improvements

For those training aircraft that were not efficient the shadow price indicated by the Excel solver results indicate how to improve the current inefficient one by referring to those efficient ones. Below are the improvements each aircraft needs to make so that they can be efficient within this group.

- For the Cirrus SR22, Maximum Cruise should increase from 178 to 224 knots, Max Takeoff Weight should increase from 3,400 to 4,143 pounds, and price of rental should decrease from \$262 to \$192.
- For the Cessna 152, Horsepower should increase from 110 to 127, Maximum Cruise should increase from 111 to 124



knots, Maximum Takeoff Weight should increase from 1,670 to 1,888 pounds, and price of rental should decrease from \$90 to \$84.

- For the Cessna 172R, Horsepower should increase from 160 to 164, Maximum Cruise should increase from 129 to 161 knots, Service Ceiling should increase from 13,500 to 19,072 feet, and price of rental should decrease from \$125 to \$109.
- For the Piper Warrior, Horsepower should increase from 160 to 164, Maximum Cruise should increase from 126 to 161 knots, Service Ceiling should increase from 11,000 to 18,194 feet, and price of rental should decrease from \$112 to \$108.
- For the Diamond Katana, Maximum Takeoff Weight should increase from 1,764 to 1,836 pounds, Service Ceiling should increase from 13,120 to 13,853 feet, and price of rental should decrease from \$104 to \$82.
- For the Piper Arrow, Maximum Takeoff Weight should increase from 2,650 to 2,692 pounds, Service Ceiling should increase from 15,000 to 16,557 feet, and price of rental should decrease from \$142 to \$124.
- For the Mooney, Maximum Cruise should increase from 174 to 183 knots, Service Ceiling should increase from 18,800 to 21,331 feet, and price of rental should decrease from \$137 to \$130.
- For the Cessna 182Q, Maximum Cruise should increase from 143 to 152 knots, Maximum Takeoff Weight should increase from 2,950 to 2,985 pounds, and price of rental should decrease from \$160 to \$140.

## Conclusion

Data Envelopment Analysis was used to compare ten of the most common rental aircraft. This tool can assist a pilot in choosing the best aircraft to rent based on the model and the results. Although the results are not able to narrow down to only one aircraft, it should make the selection easier because it narrowed

down to two from ten. The results could also assist the production companies in choosing which types of engines or materials to make to become competitive by referring to the results in this research.

Due to limited resources and data available at this stage, some dimensions that a renter may be looking for were not included. For example, maneuverability of the aircraft might be important to some pilots who wish to do more aerobatic flying with their time rather than a pilot who is just sightseeing. The range of travel before fuel is required might also be of importance to a pilot who is looking to rent and travel long distances. With more information provided, the above model could be easily extended, which could be the direction of the future research.

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## About the Author

Heather Dickerson worked during the Fall 2015 semester to complete this research on selecting the most efficient training aircraft for rental using Data Envelopment Analysis under the mentorship of Dr. Xiangrong Liu (Management). She is graduating in May 2016 with a double major in Product Operations Management and Aviation Science.

Table 1: Aircraft Data					
Data					
	Horsepower	Max Cruise	Max Takeoff	Service Ceiling	Cost of Rental
SR22	310	178	3400	25000	262
C152	110	111	1670	14700	90
C172R	160	129	2450	13500	125
PA 28-161	160	126	2440	11000	112
DA 20-C1	125	118	1764	13120	104
PA 38-112	112	110	1670	13000	74
PA 28R-200	200	148	2650	15000	142
C206	300	149	3600	14800	175
M20J	200	174	2900	18800	137
C182Q	230	143	2950	16500	160

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Table 2: Results	EXCEL OUTPUT									
	SR22	C152	C172R	PA 28-161	DA 20-C1	PA 38-112	PA 28R-200	C206	M20J	C182Q
OBJECTIVE	0.733160082	0.92974359	0.868502994	0.96535597	0.786820463	1	0.876223501	1	0.948606571	0.875886327
U1	0.00200814	0	0	0	0.004847776	0	0.003550484	0.001510371	0.001929306	0.003288329
U2	0	0	0	0	0.001532614	0	0.001122478	0	0	0
U3	0	0	0.000354491	0.000395638	0	0	0	0.000151914	0.00019405	0
U4	4.42547E-06	6.32479E-05	0	0	0	7.69231E-05	0	0	0	7.2467E-06
V1	0.003816794	0.011111111	0.008	0.00892858	0.009615385	0.013513514	0.007042254	0.005714286	0.00729927	0.00625
CONST1	0	0	0	0	0	0	0	0	0	0
CONST2	0	0	0	0	0	0	0	0	0	0
CONST3	0	0	0	0	0	0	0	0	0	0
CONST4	0	0	0	0	0	0	0	0	0	0
CONST5	0	0	0	0	0	0	0	0	0	0
CONST6	1.298608634	1.130769231	1.467065868	1.461077844	1.028384012	1	0.895046591	0	1.533742331	0.689439886
CONST7	0	0	0	0	0	0	0	0	0	0
CONST8	0.548519443	0	0	0	0.032736636	0	0.332515939	1	0.09406953	0.509275776
CONST9	0	0	0	0	0	0	0	0	0	0
CONST10	0	0	0	0	0	0	0	0	0	0

# African American Slave Medicine of the 19th Century

COLIN FITZGERALD

There were many different factors that led to the effectiveness of African American slave medicine during the early to mid-nineteenth century United States, or the antebellum period. African slaves who were taken away from their native lands carried with them their own native medical practices and knowledge. Their pre-established medical knowledge would grow over time as countless generations of African Americans would soon be exposed to the medical cultures of both Native Americans and white European immigrants. The function slave-practiced medicine would play in society during this time period would also be shaped by the new complex social conditions of slavery. The value each slave owner, as well as community, placed on slave-practiced medicine was different from one plantation to the next. This provided a number of different environments where medicine practiced by slaves was both nurtured and suppressed. Compared to the kind of westernized medicine that was being conducted by white medical practitioners at this time, especially in the south, slave-practiced medicine was in some ways advanced for its time. Considering that most all slaves in the United States could not read or write during this time, slaves who did practice medicine were largely unaware of the actual science behind what they were doing. This reason alone is most likely responsible for why medicine practiced by African American slaves was looked down upon by many white owners and doctors of the antebellum period. However, with the luxuries of today's knowledge of modern chemical science, we are able to see just how advanced some of these herbal cures really were in both their biological complexity and their ability to cure specific ailments.

The wide spread uses of medicinal herb and holistic natural plant-based remedies by slaves of the early to mid-nineteenth

century were equally as effective in treating ailments of the body when compared to commonly practiced white medicine of the same time era; and, in some cases, medicine practiced by slaves was more effective in treating the physical and psychological conditions of patients than the medicine practiced by their white counterparts. This shows that African American slaves provided a significant contribution to the medical community of the United States.

There were a plethora of different herbs, roots, barks, spices, and other naturally occurring biological components used in slave medicine. Their uses, as well as prevalence, were contingent on their availability and usefulness. Some of these cures worked well, some offered little more than coincidental cures, and others were even a bane to a patient's health. However, each of these of these cures, effective or not, built upon the already pre-established knowledge slaves had of medicine. Their experimentation with various kinds of plant based remedies is what led them to make these great, albeit unknown, breakthroughs in medicine that we still study and use today.

One particular herbal cure used by African American slaves was a plant called asafetida. Asafetida is a perennial closely related to silphium of Cyrene and has characteristics of plants in the fennel family. It is native to India and Iran, but was most likely brought over to the New World by European settlers. As its name implies, asafetida has a fetid odor to it. It is commonly referred to as stinking gum, or Devil's dung. Asafetida is popular in Indian cooking, and it has a similar taste to leeks. The



*Asafetida*

dried sap of the plant extracted from the stem and the roots, forms a resin like gum. Commercial uses of the plant mix this resin with rice flour and gum Arabic. Victoria Adams, of Columbia, South Carolina,

recalls using the plant as a preventive measure against diseases on her plantation, “[w]e dipped asafetida in turpentine and hung it ‘round our necks to keep off disease” (Slave Narratives). Asafetida was used as preventative against a number of pulmonary diseases such as whooping cough, bronchitis, small pox, and influenza. It was usually placed in a bag around someone’s neck so that they could breathe in the fumes. Asafetida is found to have worked as an anti- flatulent by reducing the amount of indigenous microflora in the gut. Because of its close relation with the famed silphium of Cyrene (belonging to the same family, ferula), it has also been reported to contain naturally occurring organic contraceptive compounds. However, its most noticeable traits are its antimicrobial (antibiotic) elements, and its ability to fight off influenza, as well as other forms of viral flus. When ingested, asafetida works in the gut to limit bacteria growth, but when worn around the neck the pungent fumes can open congested airways to kill harmful bacteria in the nasal passages. The U.S Pharmacopeia approved use of the herb to fight of the spread of Spanish Influenza in 1918. In 2009 it was later found out that the roots of the plant produce a natural antiviral drug compound that was effective in fighting strains of flu like the H1N1 virus in vitro. This may have been an important factor concerning its effectiveness against the Spanish Influenza. Modern medicine at the time did not have anything of this potency that was able to combat many of the pulmonary diseases suffered by both whites and African Americans.

The use of turpentine on these resins most likely acted similar to a “Vick’s VapoRub” in its ability to open up nasal passage ways. Turpentine also acts well as an antiseptic due to its nature as an organic solvent. Turpentine is a sap harvested from a number of different pines in the United States and is primarily made up of organic molecules such as pinenes (FAO). However, turpentine is also extremely flammable, and because of its nature as an organic solvent, it is often harmful to breathe directly into the lungs. When turpentine is applied to skin it also irritates the applied site and can cause bad rashes.

Other forms of medicine employed the uses of boiled water to dissolve polar organic materials into teas for oral consumption.

Such examples of this practice are the uses slaves had for burdock root. Burdock root is more famously known as *Articum lappa*, or the plant that inspired George de Mestral of Switzerland to come up with the idea of Velcro in 1941, after observing the way the seeds of the plant hooked onto clothing (Wiki). The root of the plant was sometimes ingested directly and other times it was ground up using tea as a means of administering the drug. Modern science has found that the root of this plant possess antibacterial (antibiotic) and antifungal properties. There is also evidence that burdock root contains compounds that demonstrate anti-inflammatory properties.



*Burdock plant*



*Burdock root*

On top of this, burdock root is a diuretic and can be used in the treatment of diabetes. Herbalists used the root for the treatment of dropsy, gout, blood purification, rheumatism, and fungal infections (Mountain Rose Herbs). This root was crucial in the production of gentle antibiotic salves and pills.

The medical knowledge that slaves contributed to western medicine is not just limited what they learned while in the United States. Some medical procedures that existed in Africa before slavery were introduced to whites in the US after slaves were taken from Africa. The most famous case is the one of native born West African (and then slave) Onesimus, who brought the knowledge of smallpox inoculation to the United States from Africa. It was Onesimus who stated to his master, the well-known theologian from Massachusetts, Cotton Mather, that he had the procedure performed on him in Africa (Niven). With the knowledge Onesimus gave him just before his

death in 1717, Cotton Mather was able to curb a small-pox outbreak in Boston in 1721 (Niven). However, the practice of inoculation in America at the time was still widely criticized. This kind of medical knowledge wouldn't become known in mainstream medicine until Edward Jenner popularized the idea through his innovation of vaccines in 1796.

As stated before, the means by which African American slaves generated this knowledge was through a complicated series of relations with people of various other races. These were a series of relationships that spanned generations all across the country. It is crucial to remember that for the most part, slaves in the United States could not read or write. In a number of the Library of Congress slave narratives (Born in Slavery), many former slaves recollect that their former masters were wholly against the idea of having their slaves learn how to read and write. Many states passed laws that forbade people from teaching slaves how to read and write. So, information regarding various skills and trades was passed down via word of mouth from generation to generation; all of this was done in order to preserve knowledge that had been so tirelessly paid for in blood and sweat.

In the case of medical knowledge, slaves would share their learned knowledge usually with their immediate family on the plantation. And, since it was not common for slaves to venture out into other plantations, much of their gained medical knowledge did not permeate far beyond their homes. Annie Whitley Ware of Texas (born in 1857) remembers her mother training her in herbal medicines: "Mammy was trained ter be a doctor. In dem days dey git deir medicine from de woods an' made deir salves, liniment an' sech. Mammy larned me what she knowed 'bout doctorin'" (qtd. in Covey 76). However, wandering "root doctors" or local herbalists were not uncommon in areas of high concentration of slaves. These people were most likely responsible for what kind of information did make it out of plantations.

African slaves, when coming to the New World, brought with them their various cultural practices and knowledge of medicine. Unfortunately, a majority of what they knew about medicine had

to be relearned because most all of their traditional remedies were based on naturally occurring plant resources that were available to them in Africa. North America was a whole new alien continent with a vastly different ecosystem. This was a similar problem that first challenged many new European settlers coming to the New World as well. For the Europeans, trained physicians were few and far between. In addition to that, supply ships from Europe that carried medical supplies for the settlers, especially during the winter months, were very rare (Covey 27). Early settlers turned toward Native Americans for help with treating illnesses and for trading medicinal herbs.

Native Americans contributed a great amount to the American pharmacopeia, and the knowledge that they first shared with the early European immigrants was still being used by physicians up throughout the nineteenth century. It was this mix of European and Native American medicine that many Africans first studied. The acquired knowledge from these new medical practices mixed with their own pre-established ones. Many Native Americans even shared their knowledge directly with slaves. Both African and Native American medicines were heavily steeped in the idea that magic played an important role in the healing process. In many African cultures someone who was a skilled healer was also equally skilled in spirit. As Herbert C. Covey (47) says, "The spiritual aspects of healing and curing-as well as the role of the family, spiritual possession, witchcraft, sorcery, herbs and plants, and beliefs played important role in traditional West African healing arts." African American slaves learned the medical knowledge of whites by direct osmosis. Marie Jenkins Schwartz explains this process: "Slaves were familiar with the therapies of the physicians. Knowledge of regular medicine among slaves stemmed from their involvement as patients, nurses, midwives, and servants" (56).

Even though slaves had learned a considerable amount of their medical knowledge from whites, such as how to diagnose ailments based on symptoms, how to conduct bedside manner, and general preventative care for ailments, there was still a stigma against slaves practicing medicine. Many whites did not trust slaves practicing medicine on the plantation, or on them. White people of the time

saw the spiritual side of African American medicine as something wholly uncivilized. They looked at people who practiced “Hoodoo” and other forms of spiritual healing as quacks. Many plantation owners forbade their slaves from treating themselves or other slaves with herbal remedies. “They feared that enslaved people waited too long before applying treatments, were incompetent, ignorant, and lazy, and were intolerant when ailments got out of hand” (Covey 43). There was also the fear that slaves would poison their masters as revenge for mistreatment. Many plantation owners would beat slaves if they were caught practicing medicine. Some white people, however, saw the benefits in allowing slaves to practice medicine, and even had family members saved by the quick action of their slaves where modern medicine had failed.

There was such a rise in the number of African-American herbalists and medical practitioners that the South Carolina General Assembly passed a law in 1749 that prohibited slaves from being employed by physicians to concoct poisons, or administer medicine of any kind. However, slave medicine continued. Many slaves saw medicine as one of their few freedoms left, the freedom to treat their own bodies. Some plantation owners would allow it unless an ailment grew out of hand, while others would only allow it if a physician’s aid failed to cure someone. Still other owners had a complete distrust of modern medical physicians all together, so they opted for their own home remedies. The conditions for what was allowed on a plantation varied from owner to owner. It was usually a slave owner’s personal experience with either slave-practiced medicine or modern medicine that gave him opinion on the matter. Some slave owners saw slaves caring for each other’s health as an opportunity for slaves to fake illnesses to get off from work. “They [slave owners] developed the attitude that if a slave complained of illness he was acting like ‘a true negro in always “poorly” to escape work” (Savitt 162). However, it was often in the best interest of the slave owner to allow his slaves to care for themselves. Slave owners did not have to pay for or wait for physicians to come and treat their slaves. Other times, having a slave treat another slave eased the mind of the patient, and it led to better morale among slaves on the plantation.

What made slave-practiced medicine so important during the nineteenth century was the state of medical care that existed in the South. Medicine, in the South, was becoming more and more westernized. Westernized medicine was, during the mid-nineteenth century, a popular emerging field that relied on the heavy usage of powerful drugs and the use of “modern” surgery to cure both physical and psychological ailments. Formally trained medical practitioners were attempting to move away from the European system of homeopathic cures that had become so popular in the United States after its conception by Samuel Hahnemann in 1796. Homeopathy was similar to the doctrine of signatures (a much older form of medicine) in the sense that it based itself on the idea that “like cures like.”

This is not to say that medical practitioners had diverged completely from homeopathic or traditional herbal remedies. Dr. Ewell, a well-known nineteenth century physician, revealed that the contents of his medical chest contained substances like Peruvian bark, gum Arabic, essence of peppermint, a tincture of fox glove, and arrow root (Covey 24). However, most of these new advancements in modern medicine resulted in harsh remedies that were typically some form of laxative, an analgesic opium derivative, a purging compound, or anti-rheumatoid in nature. Formally trained physicians began using these forms of medication heavily when treating the symptoms of both African American slaves and whites alike. Bleeding (or cupping), purging, puking, and blistering became the standard for most formally trained medical practitioners. These treatments were so frequently used and prevalent in the Southern United States that, “[m]ost issues of antebellum Southern medical journals contained articles written by doctors who routinely purged, puked, and bled their black patients, often to unconsciousness” (Savitt 14).

These practices quite often created a distrust of modern medicine among slaves, who were forcefully subjected to its treatments by their slave owners, and whites, who still clung to valued homeopathic home remedies that were usually passed down through families. These new medicines were expensive and required



a higher skill to administer; plus, formally trained physicians and medical practitioners were common only in highly populated areas of the South. In 1847 a physician by the name of Carter P. Johnson published a report in the Transactions of the American Medical Association on the number of regular and non-diploma holding practitioners of seventy-five Virginia counties and towns (Savitt 168). Around one third of these “doctors,” 294 of 972, had never received diplomas, and another thirty adhered to the Thomsonian system (Savitt 168). So many whites and white slave-owners distrusted doctors that many called upon “irregular” medical practitioners such as Thomsonianism, homeopaths, hydropaths, empirics, and eclectics (Savitt 150).

Thomsonianism was a branch of medical treatment that came from homeopathic ideologies. It was invented by Samuel Thomson, a self-taught herbalist and botanist from Alstead, New Hampshire, during the late-eighteenth century. The practices used in treatment were centered on the idea of using heat to heal the body. Hydropaths were people who, quite obviously, used water exposure as a form of medical treatment. These alternative forms of treatment were less expensive and often were available to people who lived far from the city. Often times plantation owners would permit an overseer to administer versions of their home remedies or therapies on slaves. Other times plantation owners would resort to modern practices of bleeding or purging. Much like their stances on slave practiced medicine, slave-owners’ uses of medical treatments stemmed from what they had had success with in the past. Savitt explains this when he says, “Medical practice, especially in rural areas, was a matter of trial and error rather than of application of set procedures learned in medical school” (17).

Slaves were an important investment to plantation owners, yet the overall treatment of slaves’ health was abysmal. Their health became important only when a slave became sick or injured. When in need of medical care, slaves entered a strange power dynamic. Their masters decided when they did or did not need medical care. They also determined what kind of medical treatment they should receive, such as bleedings, purging, powerful opioids, or harsh home

remedies. When treated, slaves assumed the role of a patient in need of care yet had no rights over the treatment they received as patients. Slaves would sometimes fake illnesses to avoid work, but this action came at a cost. If slaves were found to be lying, they were severely beaten. If their owners did believe that they were indeed ill, they were often forced to take powerful medicines that in turn nearly killed them.

Slave medicine was empirical in its approach, meaning that it was mostly a system of health care built over time by observations and experience. However, even though slave medicine did follow an empirical style, slaves were more attuned with what kind of natural remedies worked, and in which way. Like other natural remedies, however, there was an element of superstition that at times outweighed practical means.

One major difference between African American slave medicine and white medicine was that the basis for slave-practiced medicine was not steeped in the idea that each race was biologically different. This distinction between races may have existed in their outlook on spiritual healing, but not in their decisions when administering herbal medicines. Much of what made modern medicine so brutal toward African Americans was that it based many of its treatments on the idea that “Negroes” were biologically inferior to whites. This idea was argued after physicians in the Southern United States observed that many native Africans possessed an inherent immunity to malaria, as well as an increased vulnerability to pulmonary diseases such as tuberculosis or whooping cough. From this and other various differences in health, it was accepted by both Southern and Northern medical communities that Africans were biologically inferior to whites, and their race was designed for hard labor. Savitt explains that, “[m]edical theory and practice were still in such a state of flux in the late eighteenth and early nineteenth centuries that there was little risk of any true scientific challenge to a medical system based on racial differences” (17).

Slave folk practitioners existed primarily as midwives, grannies, herb doctors, root doctors, spiritual healers, “kitchen physicks,” conjurer doctors, and to a lesser degree, formally trained

physicians (Covey 41). However, those who became formally trained physicians were also freed African Americans. It was also, in some ways, similar to European medicine at the time, considering that it was heroic in many ways. Heroic medicine was a traditional form of medicine that encouraged the use of treatments that were physical, or immediately observable; this of course often jeopardized many patients' health. There were African Americans, both enslaved and freed, who subscribed to modern medicine during the antebellum period. However, when slaves practiced medical treatments such as voiding, bleeding (cupping), etc., it was usually at the command of their master. Most slaves, because of their traditions and aversion to these harsh treatments, sought medical care through herbal treatments as well as spiritual healing (or guidance). Slaves' abilities to treat people with herbal remedies were wholly supported by their knowledge of the environment. Those who were experienced in treating people were also knowledgeable about what was available to them in the surrounding environment.

For the most part, health care on a plantation was most often a woman's endeavor. "Grannies," or older African American women, were usually the most experienced in the realm of medicine. African American women were called upon as midwives, wet-nurses, bed side nurses, and cooks. This gave them valuable exposure to medical knowledge. Most were often too old to work on the plantations. They took on the primary role as caregiver for infants, children, and the elderly. The time away from working let gave them time to forage for roots and other medicinal biological material.

The conditions that surrounded slave-practiced medicine were not only varied, but complex in nature. There is still much left unsaid about the capabilities of slave-practiced medicine. Equally so, there is much left unsaid about its short comings and limitations. Like most medicine in the antebellum period, it was an imperfect art. Neither whites nor blacks could take credit for being completely superior to one another in medical knowledge. However, when we stop to look at the circumstances of each party, we see that the world during this time was not equally opportunistic for African Americans. For a group of people to be denied basic human rights,

to be denied the access to an education and still be as effective in the area of medical treatment, as those who were given that right, is simply remarkable. The state of modern medicine in the Southern United States was not ideal. African American medicine provided beneficial contributions to the field of medicine that had not yet been conceived. For the most part, however, like with most aspects of African Americans' life that had to do with education, African American slave medicine was suppressed. It was suppressed until it became beneficial for plantation owners to use. Asafetida, burdock root, and small pox inoculations are just a few of the many medical advancements made by African American slaves. There are still others that were even more effective and advanced for their time, and for the most part, modern science, combined with narratives of the past, have been able to weed out which ones were ineffective in their uses. Much of this information not only signifies the importance of African Americans' contributions to the American Pharmacopeia, but it also signifies the importance of African Americans' role in the advancement of westernized medicine

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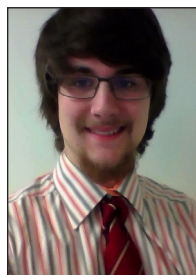
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## About the Author



Colin Fitzgerald is a sophomore majoring in Biochemistry at Bridgewater State University. His research on the topic of African American slave medicine of the 19th century was conducted during the Fall 2015 semester under the guidance of Prof. Timothy Trask (English) in his Second-Year Seminar on Survivors of Slavery. Colin presented this research at BSU's 2015 Mid-Year Symposium. Colin plans to graduate with a Bachelor of Science degree in 2018 and then pursue a Ph.D. in the field of biochemistry.

# The Power of Form in Henry Medwall's *Fulgens and Luces*

VANESSA GERRING

Philip Sidney offers in his *Defence of Poesie* that “neither philosopher nor historiographer could at the first have entered into the gates of popular judgements, if they had not taken a great passport of poetry” (Sidney 138). It is the author who is able to provide a true *dulce et decorum* experience by using his creative license to intertwine otherwise dry or controversial content with rich and golden form to produce a piece that at the very least will both instruct and delight, yet hold the power to take its audience to the forefront of a social reform movement. Through his patronage at Cardinal Morton’s residence and his careful literary wit, playwright Henry Medwall was able to challenge the nature of the aristocratic class in the audience of his interlude, *Fulgens and Luces*. Medwall uses his interlude as a tool to forward the mission of Renaissance humanists to create an ideal society.

Medwall was 24 years old when Henry VII took control in 1485. Records kept by Eton College and recovered by Alan H. Nelson age the playwright at 12 at his festival day when he was named the king’s scholar on August 1, 1474. Given that the festival day is “the ecclesiastical festival nearest to the scholar’s actual day of birth” (Nelson, “The Plays” 163), Medwall’s date of birth is on or about September 8, 1461 (Nelson, “Life Records” 111). Little else is known of Henry Medwall’s life, short of the records kept by the colleges and legal documents.

Biographers have established that Medwall was a native of Southwark, a suburb of London that housed the infamous Bankside stews. He attended Eton College from 1475 to 1480 and was subsequently educated at King’s College in Cambridge until June 13, 1483. Interestingly, Medwall’s departure from the college coincided

with John Morton’s arrest by the future King Richard III. This is an early indication of Morton and Medwall’s relationship. In August 1485, King Richard III was overthrown by Henry VII, and the new king began reinventing his court with what are known as the “new men.” They included Morton, who was appointed Lord Chancellor in March 1486 and then Archbishop of Canterbury in October of the same year. Medwall was appointed by Morton to serve as a public notary in his archiepiscopal palace at Lambeth and was ordained to minor orders in 1490 (Nelson, “Life Records” 111). Marked as a promising youth from Southwark, Medwall rose through patronage of the Tudor society.

Within a span of nine years, Medwall saw John Morton rise from Bishop of Ely to Cardinal, the position he maintained until his death on October 12, 1500. As advisor to the crown and elector of the pope, the Cardinal directly influenced the community he served. Values are passed from the highest class to the commoners through a trickle-down education system. A secular form of the Great Chain of Being, so to speak, begins with the king, followed by the nobility and church, the aristocracy, middle class, gentry, and peasants. Medwall uses the form of the interlude to illuminate the debate on the definition of nobility to his target audience. The mission of *Fulgens and Luces* is to insert humanist ideals into the minds of the influential class of people in the audience who, by the slightest grin of endorsement of a concept, could heedlessly render public approval of it.

Humanists were commonly referred to as *arrivistes* (Watkins 775). The term “new men” was used by David Bevington to describe the shift in ideals represented by the members of the new Tudor Court. Not unlike Medwall, whose family background lies in the cloth trade (Nelson, “The Plays” 4), the “new men” attempted to veil their social upbringing with emphasis on their more noble positions. In order to present themselves as equal to the aristocracy, the *arrivistes* “acquired vast holdings in land.” Still, they “had a special interest in the doctrines of humanism, and commissioned humanist writers to create a rationale for the new Tudor society” (Bevington 44). The natural nobility was not completely ignored, however. Bevington

describes a “novel emphasis on professional ability, literary training, and the innate qualities of ‘gentillesse’ that might be found in untitled men as well as in nobility” (44). Medwall was brought into the Tudor world by way of the King’s concern to populate the class with men who could provide more than a familial title to the Court. Medwall’s patronage in Morton’s residence gave him direct experience with the aristocratic class. It allowed him to witness the sinful behavior of those who were supposed to be virtuous leaders and fueled his desire to incite change.

Henry VII’s household was the “first English court to offer widespread and systematic patronage to artists and men of letters” (Kipling 118), and Henry’s patronage of drama was crucial in the development of the interlude (149). Unfortunately, his tastes inevitably alienated arrivistes, as he preferred “rhetoricians to poets [and] propagandists to humanists,” pushing the reformational mindset of these men to the side in favor of those who talk the House up to his standard (118). Medwall would have gotten a feel for what the aristocratic class valued through his employment with Morton as notary, where his main task was to serve as a witness to legal filings and documents. He would have also been familiar with “Morton’s Fork,” which was a sophisticated tax collection scheme to extort money for the crown. Imposed by Henry’s tax commissioners, “Morton’s Fork” promised the rich that they could afford to contribute and accused the poor of concealing wealth (John Morton). With corruption all around, Medwall must have concluded that the simple label of nobility does not denote a noble human being. Medwall sought to highlight desirable qualities that those who held positions of power should embody if their mission was truly to create a better society under their rule.

Following the humanist goal of creating the ideal society, Medwall had to be careful in his delivery of this challenging topic to the high class of Morton and his company. Much depended on his personal charm. Morton’s personality is described by Thomas More, who served at his Lambeth Palace as a page in 1490-1492 (Nelson, “The Plays” 17). More cleverly places this description in the mouth of Raphael during his digression about the problems with social class

systems in Utopia. Raphael explains the issue of speaking freely in the Palace as he tells the Thomas More character,

Anyway, the conversation seemed worth repeating, if only in a general outline, so as to give you some idea of the way these people think. You see, everything said was treated with contempt, until it appeared that the Cardinal was not against it -- and then they were immediately all for it. In their efforts to flatter him, they were even prepared to applaud, and almost take seriously the suggestions made by a hanger-on of his, simply because the great man laughingly approved of them. So you can guess how much notice people would take of me and my advice at Court! (35)

Medwall operates on his patronage with Morton to plant ideas in his audience’s mind with the purpose of these transformational concepts sneaking into conversation with some of the most powerful people in England. From there, they would hopefully be considered seriously.

Medwall wrote plays during his time with Cardinal Morton, who achieved his new title in 1493. The two Medwall plays that have been recovered are the interludes *Nature and Fulgens* and *Luces*. Both were performed at Lambeth Palace for entertainment as Cardinal Morton and his company of “new men” and “old men” sat in the Great Hall of the Palace. Interludes were often presented during glorious banquets in the Christmas season. Alan Nelson argues that Part I of *Fulgens and Luces* was presented during a mid-day meal, and Part II was to be performed during an evening meal. The audience consisted of “noblemen, ecclesiasts, lawyers, and married women” (Nelson, “The Plays” 18-9). A mixture of men who gained their status through merit and men who furthered the name of their noble heritage was to be found seated in the audience of these interludes. As a notary, Medwall knew how to relate to this aristocratic class, but any question he posed about their actions--or lack of--would have been treated with contempt, similar to what More describes.

To suggest that virtue is not conferred by birth would be appalling to the men and women who led their lives based on the notion that their amassed wealth was evidence of their favor from

God. Medwall needed to be cautious in his delivery of this focus on integrity in high society. An instructional interlude disguised as entertainment for the guiding voice of the ruler of England is the vehicle required to propel the humanistic vision through the trickle-down education system. *Fulgens and Lucreces* includes the right balance of time, place, and humor to accomplish this while keeping Medwall in good stead with Morton and his aristocratic colleagues.

The story of *Fulgens and Lucreces* originated in an Italian play called *De Vera Nobilitate* (1428) by Buonaccorso. *Fulgens and Lucreces* concerns two suitors courting a Roman senator's daughter. One of the suitors is of noble descent and the other is of a lesser class, yet he is the one chosen by Lucreces for his virtue. Simultaneously, two servants seek employment by the men and compete humorously for the hand of Lucreces' maid. The issue of whether nobility derived from birth or merit was not original to Henry VII's court but it was increasingly relevant as he continued to call a rising number of "new men" into positions of high rank (Norland 234). The central debate of the interlude centers on the status of the "old men" in the audience, peers of the Cardinal who may not have prescribed to the humanist message of virtue by merit and thus hindering the efforts of social reformists.

The audience is placed in the setting of classical Rome where a more specific variety of criticism could be raised without an immediate correlation to the present England. The language of law is peppered throughout to appeal to the audience. The Cardinal began his career as a lawyer, so a structured debate with a deciding party would have been a situation that he was accustomed to (Norland 234). Medwall is aware that legal terms such as "precedent" (line 432), "sentence" (435), "evidence" (728), "case" (737), and the fact that Lucreces waits for both parties to be present, would earmark the subject matter as meaningful, and the language he gives to his characters reflects his authorial design. Medwall hooks the aristocrats and strings them through the entirety of a didactic episode before the noblemen could know what had been done to them. It is not until the conclusion of the interlude that the audience is made aware of Medwall's intention. He has a servant character close with:

That all the substaunce of this play  
Was done specially therfor  
Not onely to make myrth and game,  
But that suche as be gentilmen of name  
May be somewhat movyd  
By this example for to eschew  
The wey of vyce, and favour vertue.  
For syn is to be reprovyd  
More in them, for the degre,  
Than in other parsons such as be  
Of pour kyn and birth. (888-898)

The interlude is specifically crafted for the purpose of persuading the nobility to consume the humanist interest of a new class of leaders. Those whose gleaming virtue is derived from performing good deeds in the community, with the objective of improving life on earth, were desirable. Renaissance humanists hoped to rid the Court of leaders with the effortless label of "noble" given by chance of birth in the lineage of their name.

Two very different definitions of nobility from the suitors leave Lucreces to use her rational faculty to make the decision of who the nobler of the two is. Cornelius defines his nobility as the ability to "spend all your dayes in ease and pleasaunt idelnesse" (549) with "riches ... At your will ever more" (547). He claims that his ancestors have "Delyverd this cyte from dedely parell" though it was done so through the means of murder and theft (466). Gaius, the humbler man, counters that they are both born of God: "That both he and I cam of Adam and Eve. / There is no difference that I can tell" (665-66). He has devoted his life to God, has been loving to his friends and family, and spends his time studying so that his hands will not be idle. He continues that he can afford Lucreces "moderate riches, / And that sufficient for us both doutles" (696-7). He cites Corneilius' actions as having no "proffitte, no more do ye, / To the comon wele of this noble cytie" (618-9). Lucreces chooses Gaius, the commoner, for the very specific reason:

That a man of excellent virtuous condicions,  
 Although he be of a pore stoke bore,  
 Yet I wyll honour and commende hym more  
 Than one that is descendide of right noble kyn  
 Whose lyffe is all dissolute and rotyde in syn. (789-93)

Though Lucrez declares Gaius as the better man, she is careful to proclaim that she will “not dispise / The blode of Cornelius ... But unto the blode [she] wyll have lytyl respect / Where tho condicyons be synfull and abiect” (759-65). Medwall is turning the mirror to his audience. Hearing the justification for selecting a mate and future head of a family forces the audience to consider their own actions. Without suggesting an outright disdain for the lazy nobles, her rejection of them is outspoken, and provides grounds for further acceptance of the Gaius-type.

Medwall pairs his characters’ spoken words with a specific rhyme scheme that denotes their social class standing. Fulgens, Lucrez, and the suitors Cornelius and Gaius speak in rime royal (the seven-line, iambic pentameter, ababbcc-rhymed stanza used by Chaucer in *Troilus and Criseyde*). Rime royal identifies its speakers as dignified and the narrative as serious. The comic servant figures speak in tail-rhyme, which features longer stanzas of shorter lines (with a scheme of aabcccb with the a- and c- lines typically tetrameter and the b-lines, or the tail, trimeter). The different rhyme patterns establish alternate poetic and moral domains (Cartwright 40-1). People in the Renaissance had a keener ear for the cadence of language than we do today; they would have immediately recognized this change in rhyme as it was being performed and inherently understood the representational meaning of that shift.

As the moral domain shifts, the characters shift from being members of the residence to servers on the stage. “A” and “B,” placeholder character names meant to be filled by players in the audience, pass from the “real world” to the “stage world” and bring the audience with them when they do so. With the ease of this transition, the servant characters demonstrate to an aristocratic audience that the risky notion of a society where men of merit come

into power is accessible and quite easy to obtain (Jones 131). The servant subplot also provides comic relief to the risky main plot. The subplot frames the Roman story and distances the aristocratic audience through “mirth and game” (890). Some of the comedy that A and B use can be found at lines 178-205, where Corneilius sends his servant B to remind Lucrez of the noble time when he saved her from a cuckoo bird by throwing her “musk ball,” which is an expensive container of perfume, at the bird. Then about 100 lines later, the servant gets the story mixed up and “reminds” Lucrez about the time that either she “kyst hym on the noke of the arse” or he kissed her (283). We also see A poke fun at the seriousness of the topic at line 842 when he asks, “Vertue, what the devyll is that?” Medwall has Lucrez declare that she will set no precedent and speaks only for herself as another attempt to keep potential outrage over her choice at bay (Cartwright 42). At the very end of the interlude, the servant speaks to the audience, and relieves Medwall of any wrong doing by making a joke about him when he says,

At the lest ye will take it in pacience.  
 And yf therebe ony offence --  
 Show us where in or we go hence --  
 Done in the same,  
 It is only for lack of connynge,  
 And not he, but his wit runnynge  
 Is there of to blame (908-14)

“B” blames Medwall’s lack of skill and crazy mind for the substance of the play so the audience should not take any offense by it. Medwall was able to maintain his position in the Cardinal’s residence for some time after Fulgens and Lucrez was performed, although his infusion of humanist principles in his interludes marked him as a threat to the “old men” of the noble class.

Medwall was protected by his relationship with the Cardinal. Just four months after the Cardinal’s death, the Prior of Christchurch Canterbury filed suit against Medwall for the recovery of the archiepiscopal documents from his time at Lambeth. Records show letters of protection from arrest for one year, followed by his “voluntary resignation” in June 1501 (Nelson, “The Plays” 168).

Medwall then seems to disappear, perhaps by fleeing to another country, or by death. It is clear that he was targeted by enemies of the Cardinal.

As one of the most powerful men in late 14th century, Cardinal Morton was a crucial factor in Henry Medwall's ability to present his *Fulgens and Luces*. Medwall employed the form of the interlude as an intentional mask for the humanist agenda of replacing "old men" with "new men." Luces is given the opportunity to use her rational faculty to choose a noble suitor to take her hand. This is a humanist value. The push for the redefinition of nobility as one who does good deeds and is of good heart rather than of noble decent illustrates the humanist movement to create the ideal society, one with good people due to virtuous actions. Medwall dramatizes the humanist concept that choices and actions lead to virtue, not the social class into which a person was born. In order to create the ideal society you need to act, not just be.

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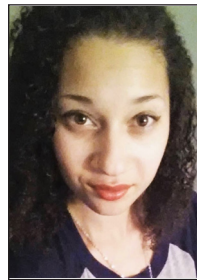
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## About the Author



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# Reclaiming Social Media: A Weird Stance Against the Social Marketplace

ANDREW HOULDCROFT

This essay challenges the extent to which Facebook defines a “false promise.” The promise, as defined by Adorno and Horkheimer (1944), refers to an illusion of choice in which individualism has been kidnapped by an oppressive culture industry. This idea challenges cultural distinction to replace its offer of individuality with the notion of a false consciousness. By essence of this argument, individuality has been engineered through a manufactured interest in which “the diner must be satisfied with the menu” (Adorno & Horkheimer 1944, p. 11). We are therefore prompted to question the legitimacy of a certain “liberty of choice” as the market has inherently limited the range of choices we might make.

Social media, framed in the context of a social marketplace, prompts a similar discussion. Online expressions, whether they relate to posted or liked content, have been increasingly framed through a commodified lens. For example, Heyman and Pierson (2013) describe the ongoing surveillance in which a user’s behavior is logged through Facebook’s interface to present specific advertisements which exploit and capitalize private interest. The site’s data policy sheds further light on these concerns. It explains the site’s willingness to share information “within the family of companies that are a part of Facebook,” while admitting to practices of hyper-surveillance (see Data Policy). These tactics, combined with the sheer scope of the Facebook brand, define its platform as a possible extension of a manipulative culture industry.

Additionally, there remains a modern emphasis on conceptualizing the social network as a tool for self promotion

versus a social space. A narrative of successful image management has pervaded our culture while an online climate of fear enacts internalized practices of censorship and social restriction. It is through these phenomena that we, as individuals, lose our claim on the online social space, relying on a social script defined through commodification of socialization

In consideration of a newly established “weird” approach to social media, I posit that users are acting in opposition of social industrialization. They are informing the construction of an online authentic culture set beyond the social marketplace. I refer to the specific experiences of one weird Facebook community, the Cool Freaks, to illustrate a new way of envisioning social media as a space which preserves private interests and promotes personal expression.

## A Narrative of Being Noticed

First, we must understand that online identity is constructed. The work of social theorist Erving Goffman (1959), while pertaining to offline environments, is helpful in framing the self as less organic than it is performed and presented. Through this lens, the self marks a negotiation of identity in which an individual adapts their image in the presence of a specific audience. A common example of distinction in self performance lies in the difference of how one behaves between family and friends. In the company of family, one restricts their behavior while in the company friends, one might adopt a more liberal manner of speech. This distinction in social behavior between audiences thus denotes an adaptation of identity dependent on context.

Social media relates to one context. This phenomenon, referred to as context collapse, infers that, in the absence of a tangible audience, the web presents identity before a loosely defined online audience which simultaneously constitutes friends, family, and employers (Marwick & boyd 2011). Additionally, this has the effect of condensing one’s complex identity, one which is defined by multiple contexts and performances, into a single image and site of performance (i.e. the profile). This image marks the intersection of competing audience expectations which complicate our discussion

of the online self. For, as some might note, these expectations might be met through audience divisions made by privacy options. However, I contend that, in lieu of a common narrative of successful image management, the individual has been culturally geared to recognize social media as a site for the public consumption of their image thereby discouraging audience division and encouraging active efforts at being noticed before the widest online audience possible.

Hearn (2008) alludes to a similar narrative of self commodification as it is, “marked by visual codes of the mainstream culture industry,” which posit the success of a branded persona, a version of the self meant to be consumed (p. 197). For example, she refers to reality television as one of many cultural texts which has marked the financial benefits of adopting a self brand or persona. This narration infers that, in conceptualizing the self image as a self brand, the individual works toward being noticed in a way which might “produce cultural value and, potentially, material profit” (Hearn, 2008, p. 198). In relation to social media, we see these ideas perpetuated through stories of those who have “gone viral” or have been noticed by significant media entities. As Van Djick (2013) notes, users who have garnered enough of an online audience “may receive offers from companies to distribute promoted messages... and be rewarded materially or symbolically” (p. 203). I refer this point to the example of Robinson Meyer, a Twitter user who was employed by The Atlantic for his social media skills (see Madrigal, 2013), to illustrate this point amongst other “micro-celebrities” whose fame originates from a successful online performance.

These stories mark the likelihood of being noticed as the profit gained from a “social factory.” This metaphor of the profile as a factory implies the need for a consistent rate of production (i.e. posting content) as it relates to a demand represented by social capital: the numeric indications of a social network (i.e. friends or likes). In the context of this model, social capital relates to a representation of one’s popularity and, by that same logic, their brand’s success. Therefore, a question of whom content serves is answered by this narrative of self commodification: Content serves anyone whose likes and friendship boost the popularity of the brand;

it serves anyone willing to indicate their consumption of a user’s image or persona.

This narrative then refutes the distinction between a frontstage and backstage self, defining the use of social media as an ongoing performance of social labor (Goffman 1959; Hearn 2008). It enforces a social script in which actors must entertain their audiences to represent interests beyond those of the individual. This shift in the value of private interest infringes upon the social potential of the platform and endangers the likelihood of producing an “authentic” or lived culture through an online medium. Adorno and Horkheimer (1944) specifically note the distinction between the culture industry and authentic culture as being the difference between motivated and liberated forms of expression. I contend that if online expression relates to a dominant mold for social and financial success, then it no longer offers a represents authentic culture. It thus defines a deception in which social media markets itself as a platform for individuality while, in reality, adopting a cultural set of boundaries defined by taste.

### **Toxic Innovation of Online Aesthetic**

Bourdieu (1979) describes the notion of aesthetic as an indication of “one’s position in a social space” (p. 206). His work in *Distinction* defines the aesthetic as a look which gives purpose and meaning to the individual as they relate to a larger society. Furthermore, he defines taste as a social sense of classification, one which creates a hierarchy of what distinguishes the aesthetic (e.g. distinctions of beautiful and ugly). The aesthetic is thus classified by taste within a hierarchy of its accordance to social expectations. In relation to our previous discussion, we might regard the image or brand as a user’s aesthetic classified by their online behavior.

For example, Hollenbeck and Kaikati (2012) note how the information a user displays informs elements of their aesthetic. Their observations of Facebook activity related to liking certain brands indicated how this information illustrates “actual” and “ideal” versions of identity. An actual like might reflect one’s personal interest in a film or restaurant whereas the ideal like remains associated

to brands which communicate maturity or professionalism. Both forms of information speak on behalf of a user's character or ethos in this way. Several of the responses in this study indicated how debilitating the relationship between information and aesthetic was, expressing a fear that they might make a wrong choice based on personal preferences. One user noted that, "sometimes it's just best to say nothing," (Hollenbeck & Kaikati, p.403) as taste remains a difficult thing to read in the face of an online audience. In short, this sentiment expresses an aversion toward personal expression as it may or may not threaten their brand.

If the concern for usage lies in preserving the brand and its reception, then I once more affirm that what is reflected in social media is rarely personal or individualistic. The virtual image, in addition to being a product, is framed through a certain marketable aesthetic which communicates a detached "ideal" self. This tailored self reflects one's ability to perform within a colonization of interests; it follows a series of decisions which are worth making (i.e. those which promote the brand and follow the narrative of success). Beyond this, the previous response also indicates that, if a personal decision alienates or implicates the user from what is expected of them, then the individual would rather opt for silence thereby removing themselves from a space which apparently relies on and encourages their participation, a space of social democracy.

Yet, in opposition of the aesthetics described in a narrative of being noticed and through branding literature, there remains a certain call for personality through promotion. For example, Aubrey and Rill (2013) found that users who approached Facebook for its "sociability" functions were rewarded with larger rankings of social capital. These findings, combined with other research concerning online audience perspectives (see Marwick & Boyd 2011; Karakyali & Kilic 2013), imply the need for balancing personal and promotional incentives in constructing a successful brand. This implies that the image created for status purposes, that is, the image which follows the script and its tastes too closely is regarded as illegitimate or overtly corporate. Therefore, the user must maintain a sense of distinction which makes them relatable without compromising the marketability

of their brand.

These messages contradict themselves in requesting innovation through tradition, difference through standardization. For, as the narrative dictates, those who defy expectation risk threatening their brand and chances of entering the workforce. I draw this point to the near boundless examples of those who have posted images of themselves with friends online which may inappropriately depict the consumption of alcohol. We belong to an environment which requests personality while, in the face of its reality, scorns its depiction.

This request further illustrates itself through a survey conducted in 2011 by Reppler, a site which assists in online image management. Across 300 employers, 90% of them admitted to using Facebook, Twitter, and LinkedIn as a means for screening prospective employees (see Swallow 2011). Yet, among these three, they most often referred to Facebook perhaps in search of more personal or social expressions of identity. This focus would, from my perspective, imply a conflict between explicit and implicit definitions of what is worth seeing: The online audience is fascinated with the reflection of a personal self while assessing its value upon a fine line between creative innovator and alienated delinquent.

I suggest that this contradiction debilitates the user and stifles the extent of their individuality. This call for innovation within the borders of taste draws toward an increasing fatigue of usership wherein the individual is torn between self-expression and promotional performance to a point where silence may be the only answer. Again, this is the offer of a promise: a call for innovation and cultural challenge, set within a mold which limits such options. I further argue that this point enacts the restrictions of social media while furthering the idea of the self as a commodity which must differentiate itself through superficial difference.

### **The Weird Option:**

*"The struggle between tradition and innovation which is the principle of internal cultural development in historical societies, can be carried on only through the permanent victory of innovation."*

- Guy Debord, *Society of the Spectacle*

To further my argument, I draw a connection between the previously described phenomena and the critical theory of the spectacle. This theory alludes to the subjugation of “living men” to “the economy” in which the lived experience has been replaced by commodity (Debord 1967). I relate this to the ongoing notion that our private interests and ability to express individuality have been kidnapped by the sociocultural emphasis on social media as a tool for promotion. In addition, we may connect the previous discussion of necessary innovation to the quote I have provided, framing our means of challenging this system: We must reclaim innovation; we must meet a promise of creative individuality.

In this discussion, it is important to note that social media is a spectacle by design. Its very relation to life functions as a mere representation of lived experience, dissecting life into a series of snapshots portrayed through statuses or photos. Yet while the complexity of a lived experience is lost in this translation between actual and virtual worlds, the potential of a virtual or representative space offers its own sense of authentic experience or, at the very least, the potential for cultivating an authentic culture. For instance, we have never before encountered a resource which allows for a level of such intimacy between individuals geographically and temporally disconnected. It is through the offering of online profiles and their opportunities for interaction that we might encounter fascinating ideas, engage in meaningful discussions, and create for ourselves a means of disseminating culture horizontally in the context of a thriving community. I once more refer to the unrealized potential of this environment which has, to this point, been conceptualized as taboo or threatening to the user.

I posit that, in its ability to link like-minded users and to create situations outside of a traditional cultural perspective, the unconventional or weird use of Facebook sets an ideal stage for jamming culture. Lasn (2000) describes culture jammers as those who “take daily leaps of faith, or of courage... that take them outside market-structured consciousness” (p. 419). Using this definition, it may be stated that those who deny the online narrative for success,

those who embrace a virtual life outside of the social marketplace and thereby endanger their brand or image, are those who jam culture. It is by these actions that we see a reclamation of the online space as a site for open socialization and the development of communities which “escape the consumerist script” (Lasn 2000, p. 420).

To elaborate on the notion of alternative usage, there presently exists a new wave of notably postmodern Facebook users. These users, part of a trend referred to as Weird Facebook, are those who challenge the need for marketable or comprehensible online behavior. Their use of satire, irony, and absurdity shrouds their behavior and alienates them from the larger social environment. For example, one of the Facebook groups which belongs to this trend is that of post aesthetics, a page in which users are prompted to share images or anecdotes which best represent their identity and sense of humor. A quick glance through the page might elicit images of dogs wearing sunglasses, stories about users’ encounters with “fragile masculinity,” or self-aware posts such as the following:

“aesthetic: people gradually starting to post uncomfortable, weirdly intimate second person diary entries in this group. please stop.”

These pages envision themselves as part of a Wild West of Facebook activity, a domain in which there are no expectations or limitations. Behavior is not predicated on promotion nor is it defined by a normative social behavior. Instead, it challenges a capitalistic motive to pioneer alternative usage and, by extension, cultural challenge. For, as the description of post aesthetics reads:

In early June of the Year of our Lord 2k15, social factors within Post Aesthetics and its minoroutlying islands had led to a period of general confusion, distrust, and hopelessness. The meme economy had become disastrously inflated, with bad content being exchanged for like counts in the hundreds. This increasing commodification of shit memes, such as Pepe The Meme Frog, Steel Beams, and Tumblrcore Meme Hell, led to a bloated, ineffective content creation machine. Post Aesthetics’ most devoted investors and aesthetes withdrew their content from PA, leading to the Great Post Aesthetics Crash of 2k15.

This sense of aimless expression encapsulates the ethos of a culture jammer. It is by this approach that these users reclaim some aspect of what culture might “promise” in the form of individuality and self-interest. Yet in defining this behavior as oppositional, there exists some tension between Facebook’s interface and these aims. For instance, the system has issues associating these pages with major brands or advertisements; it has difficulty translating these groups towards a marketized model (see Pedersen, 2014).

### **“i just like witches, the simpsons and smoking pot”**

While many of these weird groups remain disconnected either by Facebook’s interface or their separate establishment (there are several groups regarding “aesthetics,” all unconnected to one another), the Cool Freaks community of pages represents a concentrated effort at forming a larger society of alternative Facebook users. Through their pages, each divided by the content it deals with (e.g. coolfreaks.jpg for pictures, coolfreaks.mkv for videos, or Cool Freaks’ Wikipedia Club for Wiki articles), users share information through articles, express themselves through images, and socialize with one another in what is described by its moderators as a “safe space.”

I was first drawn to their community through a mutual friend who recommended their Wikipedia group. After submitting a request to join, I was added to the group about three days later and exposed to nearly fifty posts in my newsfeed regarding articles that members had found interesting in addition to information that needed to be corrected. I had never before been engaged with such a thriving space which prompted its users to create meaningful interactions outside the guise of promoting oneself or eliciting specific responses. This was exactly the horizontal spread of culture which fit a demarketed label, a system wherein information and culture was shared across individuals rather than major media sources. Likewise, this was not a bazaar of competing self brands seeking social capital. It was instead an open forum of personal expression and private interest, one which challenged my own censored usage of the platform.

To understand their orientation within a social marketplace

and to interpret their perspective, I utilized a convenience sample of 9 moderators from the Freaks and conducted a series of semi-structured interviews. These interviews were carried out through email and Facebook’s messenger service to facilitate scheduling issues and differences in time zones. Questions ranged from general to specific, all concerning the purpose of the page, how it is maintained, and what it offers its users that is different from other forms of social media. As the title of this heading suggests, I was met with a fascinating range of responses all of which related to a discussions of brands, aesthetics, and alternative social media culture.

I first asked moderators to provide a grand tour of the Cool Freaks pages. They explained the division of content based on interests and, as previously noted, the nature of a page’s requested content. Each page denotes the specific media being shared while they all maintain a larger element of inclusivity. As one moderator noted:

On a very surface level, it’s our mission to share thoughts and information regarding cool stuff or stuff that folks find interesting-- whether it’s weird pictures gathered from other domains on the world wide web, or bizarre wikipedia entries regarding esoteric subjects, or the funny or serious ideas of other users. However, it is also a part of our mission to try and make these spaces accessible to all types of people, whereas other internet forums devotes to weird or silly subject matter is frequently exclusive to people who are either not affected by racist, sexist, or otherwise violent content, or to people who are able to stomach racist, sexist, or otherwise violent content so long as there is a payoff of that which is cool and freaky. To that end, we try to make our groups accessible to people of color, people of alternative genders and sexualities, people who have survived trauma, or other people that would be marginalised in “other” subculture spaces on the internet in various ways. This is accomplished by 1) creating rules for tagging various types of upsetting content and 2) removing users who are not willing to comply with our dedication to being anti-racist, anti-sexist, and otherwise protecting marginalised people.

By this mark, the Cool Freaks series of pages distinguish

themselves from, as another moderator called it, the “white dude [focus]” which other online spaces represent. These remarks indicate that this group is constructed by and for marginalised peoples with opportunities for expression offered to each and every member. This space therefore meets an enhanced semblance of the “connection” Facebook promises (see Company Info), offering a platform of equal and safe representation. This is further represented in the response of another user who described the group’s political alignment as, “anarcho-communist... something like a third-wavey intersectional leftism that kinda works out leftism in an individualist framework.”

I further questioned their thoughts on Facebook’s data policy. Their responses indicated a desire to build this platform somewhere else, somewhere beyond the “scheme” of having their data monitored and sold across this site and others. Yet they noted the same magnetic quality that other weird Facebook groups have (see Pedersen, 2014) in drawing a large base of users in. One moderator respond with:

*if facebook made profit, it's for their coffirs [sic], not ours  
they've done nothing to ub, benefit us for the most part outside of being a  
bare  
bones platform  
when they actually take shitty hate filled messages down and not sell our  
data  
then maybe, maybe theyre [sic] on our side*

Another shared with me their perspective of Cool Freaks’ orientation with this policy:

*The primary goal of the creation of facebook “groups” was to create another method of driving user engagement. By letting people create and maintain groups centered around their interests, not only are users incentivized to stay on and interact with facebook longer, the nature of the groups themselves and the demographics within generate yet another data-point about what is hot with whom. Cool Freaks Wikipedia Club (and by extension the other parts of the cool freaks network) is no stranger to this phenomenon. By gathering together some 37k members with a /very/ high level of engagement we’re a strong dynamo for generating marketable data. That said, facebook no longer supports groups*

*to the extent it once did; rather more effort is put toward pages these days. They get all the tools to see demographics and interaction with the pages and also offer to “boost” said pages for a direct payment, so the revenue generated by pages is clearer than the revenue generated by groups. Clarity appeals to upper managers, yanno? Anyway that’s why the actual features for groups haven’t expended [sic] at all for the last two years and they shut down their group administrator feedback group earlier this year.*

This limitation of group development implies where Facebook, as a company, places its emphasis. If behavior cannot be as easily monetized as other features in the interface, then these more social aspects of the site are not worth developing. This signals the ongoing commodification of socialization and produces a tension between the more social groups and the interface of which does not reflect their interests. For instance, several of the moderators expressed a concern for the already developed moderation tools provided through the interface and requested these features be updated to assist in keeping users from rejoining a group and in identifying those who have broken their established rules.

I followed up on this frustration to question their strategies for preserving the community. The general rule of thumb for each of the moderators is to preserve a “safe space” for sharing esoteric content. To achieve this, the team has developed strategies for screening incoming members of the group by first making the group secret and then briefly perusing a new member’s profile for any indications of a threatening bias of extremist view. This approach limits usership to some extent while preserving the ongoing innovation these pages represent. As many of the moderators noted, these measures are not to limit the ongoing conversations or communications; they are meant to maintain a climate in which everyone feels comfortable expressing private interests. Similarly, each group asks that users preface their content according to a series of trigger and content warnings outlined in an accessible FAQ. This is done to provide an equal experience to each user and to allow for liberal yet cautionary expressions of interest.

Some regard these practices as a “fascist hypersensitivity”

given that any effort to defy the rules of tagging content and remaining open-minded results in an immediate ban. Those who break the rules are interestingly brought through a brief rehabilitation program (i.e. transferred to a page for banned users) in which users “can state the offense that got them banned, prove to a moderator that they are repentant, and be welcomed back into the Cool Freaks family” (see Donaghey, 2014). In questioning the moderators directly, they conferred with me that what they seek in a rehabilitated user is less of a surrender than it is an apology. The purpose of these groups is not to isolate or alienate a particular perspective, rather, it is to keep each view in check in a way which does not give preference to one voice over another.

In addition to these points, my questioning frequently invoked the use of the word “aesthetics.” I had noticed that, in my brief foray with these groups, that there were users who would caption images depicting bizarre styles of dress (e.g. a screenshot of costume designs taken from the 1993 Super Mario Bros. film) with the caption of “my aesthetic.” I questioned the definition of this term:

*HOO BOY*

*well at this point i honestly don't know anymore*

[...]

*the word no longer has meaning but in a way it's...still with its meaning? does that make sense?*

[...]

*so it's the more visual part of self branding*

*and others branding others*

*i actually discussed this with someone last night weirdly enough*

*that i called their aesthetic “mysteriously preppy”*

*and while that's not their self brand*

*it's sort of a facet of it*

[...]

*as for my own aesthetic*

*i just like witches, the simpsons and smoking pot*

Aesthetic, in the context of these groups, refers to visual and stylistic interests. They serve to the same capacity as Bourdieu's (1979) definition in distinguishing the individual while, in the context of a liberal-minded group, adhering to less of a hierarchy of taste. The cyberpunk aesthetic, for instance, may not fall beneath those drawn to a classical or retro aesthetic as these are all alternative approaches to defining the self; they are the defining qualities of a “Freak.” The other moderators took similar approaches to this question of aesthetics, regarding it as a “visual shorthand” for communicating an individual's identity.

Finally, I asked how this group relates to the larger social media environment. Responses noted the ways in which this system is more socially-oriented and interest friendly. They noted the ways in which this model “preserves individualism” and develops a space and situation beyond the pervading narrative of being noticed. To conclude, I will provide perhaps the best illustration of this sentiment:

I think a lot of people in Cool Freaks' have been using the internet as a source of community for a while. I don't know if that's a common thing for people my age, but it's certainly something that I feel is common among the other moderators.

### **The Drift and The Promise**

Lasn (2000) further describes the culture jammer as an individual with “a strong gut feeling that our culture has gone scandalously wrong and they just can't participate anymore” (p. 425). I find that, in these responses, the users I have questioned are fatigued by the dominant culture of social media with its exclusivity and devotion to consumerism. The Cool Freaks do not embody a blatant revolt to this system, rather, they represent a dissent from the dominant voice of digital culture, offering those who deny the label of a “Facebook™er” and those whose tastes alienate them a safe space to express themselves. This is a call for reclaiming the creative experiences of socialization and the construction of an environment we may drift through.

The Cool Freaks encourage the derive, “the drift,” to which one approaches “the whole spectrum of feelings you encounter by



chance in everyday life” (Lasn 2000, p. 417). They connect individuals whose expressions are innovative and free from expectation offering them the opportunity to meet with individuals and encounter bits of our culture by mere chance. There is no inherent goal beyond preserving the sanctity of the space thus freeing us from any mental slavery an audience might instill in our usership. Their groups offer liberalizations of taste and brief interactions with esoteric texts and subjects which are not inherently judged or ranked within the society itself, but offered to users in what can only be described as an intimate or private relationship.

This is not a Shangri-La set beyond a consumerist framework, for all of this activity is still related to a monetized system of surveillance; it instead offers a challenge to modern conceptualizations of social media. The ability to create these spaces, these situations outside of the climate Hearn (2008) describes defines a new potential for Facebook as a site in which we may create an authentic culture. This brief look into the alternative use of social media provides a glimmer of hope for individualist frameworks and may, in some sense, challenge the narrative of the brand as oppressive or limiting. It thus provides the backstage our cultural climate disadvantages and illustrates the sense of community which might be achieved in providing a space for expressing private interests. If we could foster such spaces and label them as more than weird or freaky or abnormal, then we might pave a new road for digital communications, one which remains all-inclusive and perhaps greater serves the needs of our presently fatigued public.

Until then, I conclude that Facebook marks the intersection of the mass culture industry and authentic culture. It provides a space which, according to the branding narrative, discourages individuality while providing a chance for this new wave of usage to break from the capitalistic script, to realize the sense of social democracy this sphere prides itself upon. I imply that, through using an extension of the mass culture industry (i.e. Facebook), we might reclaim its purpose and adjust its meaning to make it our own and to serve the greater public. To draw on Adorno and Horkheimer’s metaphor of the diner and its menu, I posit that, through culture jamming and

alternative approaches to use, we might break free from a menu of social of options, redefining the purpose of the diner as a site for sharing a variety of tastes. In other words, we might “uncool” the spectacle of social media, returning it to a weird yet hungry and fatigued social collective.

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## About the Author



Andrew Houldcroft, also known as Andy, is a senior majoring in Communication Studies with a minor in Women's and Gender Studies. He researches topics of subjectivity and online identity as they relate to social powers. He wrote this essay with the guidance of Dr. Maria Hegbloom (Communication Studies) and presented it at the Eastern Communication Association 2016 conference in Baltimore, MD, funded by BSU's Undergraduate Research Conference Travel Grant. Andy intends to pursue graduate school to study digital communications. He hopes to provide meaningful dialogue on the impact of online visibility and culture as it reflects previous theorizations.

# The Effects of Physical Education Experiences on Homeschooled Students and Families

NATASHA KANE

## Introduction

The number of homeschooled students in the United States continues to rise year after year. In 2011, 3.4% of the school-age population was being homeschooled, which was a jump from 2.9% in 2007 (HSLDA, 2013). A study done by the U.S. Department of Education conducted in 2013 reported that approximately 1.77 million students are homeschooled in the United States (United States Department of Education, 2013). Due to these substantial numbers, many students and families are having to find ways to fulfill certain requirements, one of which being physical education. Physical education is a mandated subject in public schools and many private schools; however, many homeschooled students often miss out on these structured and purposeful classes (The General Court, 2015). Fortunately, the recent passing of the Every Student Succeeds Act (ESSA) supports the role of physical education in the public school curriculum and acknowledges physical education as a part of a student's well-rounded education. Physical education is therefore significant to a child's overall educational experience. Consequently, the purpose of this study was to investigate how homeschooled students and their families are effected through participation in physical education experiences, including any behavior changes, health changes, increased learning, or derived enjoyment.

## Literature Review

Physical activity and the desire to move are innate characteristics of young children (Haywood, Getchell, 2014). Physical education classes in public schools have evolved throughout the years to become a necessary and purposeful part of a child's education. The focus of physical education is not only on acquiring motor skills and developing fitness; it places an equal emphasis on the three domains of learning—the psychomotor domain, the cognitive domain, and the affective domain. Each of these domains affects a student equally and contributes to their development of becoming a well-rounded individual (Baumgarten & Langton, 2006). The psychomotor domain focuses on movement skills, fitness, and the overall physical activity experiences of physical education. Physical activity has many benefits, including strengthening bones/muscles, improving cardiovascular fitness, and more (PHIT America, 2015). The cognitive domain focuses on the knowledge of skills and tactics, movement concepts, and the overall understanding of physical education which acts as a catalyst for skill proficiency. Since the main goal of physical education is to lead students in the direction toward a lifetime full of physical activity, the cognitive domain is essential in helping them understand why this is important (SHAPE America, 2015). Lastly, the affective domain focuses on personal and social behavior, respect, sportspersonship, and attitude (Baumgarten & Langton, 2006). There are many methods that public school teachers use to teach students about these concepts, each of which helps promote their physical and mental well-beings. Section III in the General Law of the Commonwealth of Massachusetts states that physical education must be taught to all students in public schools to promote the physical well-being of each and every student (The General Court, 2015).

## Context of Current Research Studies

With the increasing numbers of students being homeschooled, there must be sufficient benefits to a homeschool education compared to a public or private school education. In fact, a study conducted in 2009 by the Home School Legal Defense Association

(HSLDA) found that homeschooled students scored 34-39 percent higher than public school students on standardized achievement tests (HSLDA, 2009). The HSLDA, in this same study, researched the differences in approaches that homeschooling families take in regard to education; they found less than a 0.5% variance in achievement based on various approaches. The degree of structure, the amount of time spent per day in parent-directed learning activities, and the enrollment in a full-service curriculum are all different approaches that contributed to the 0.5% variance in achievement. This means that homeschooling can be very versatile and often yields similar results from student to student. Nonetheless, homeschooled students consistently outperform their public school peers. (HSLDA, 2009).

In terms of higher education, more than 78% of college admission officers indicated that homeschool graduates perform as well as, or better than, traditional high school graduates in university courses (Journal of College Admission, 2004).

A common myth regarding homeschooling is that it produces social misfits. Homeschooled students are actually exposed to a wider variety of experiences and situations than traditional public school students, whose environments are limited to a certain number of people of similar age and socioeconomic status and backgrounds (Romanowski, 2006). Additionally, homeschooled students typically have a more flexible and dynamic schedule allowing them the ability to learn real-life skills and social interaction.

The benefits to a homeschool education are plentiful, as seen through the growing number of families choosing this educational process over the traditional public or private school education. However, even with all of these benefits, there is still a need for structured and purposeful physical education classes and physical activity; homeschooled children lack the physical education classes and the physical activity options available in schools. There have been no known studies conducted to learn about the effects of physical education opportunities on this particular group. Therefore, the purpose of this study was to investigate any effects in terms of behavior changes, enjoyment, learning, and any other impacts of physical education experiences on homeschooled students and their families.

## Methods

**Participants.** Participants included six elementary-aged homeschooled students and three parents who participated in a physical education opportunity offered at a mid-sized liberal arts university in Massachusetts, Bridgewater State University. Four of the homeschooled students had been involved in the physical opportunity for five years, and two homeschooled students had been involved for one year. Data was collected during the spring of 2015.

**Instruments.** Data collection included 60-90 minute focus group interviews, surveys, and written artifacts (i.e. student pre- and post-assessments). Survey questions asked the following:

1. How long has your child been involved in the physical education experience?
2. What did your child enjoy most about the physical education opportunity?
3. Did you notice any changes to your child's overall attitude through participation with this opportunity (e.g., happier or more energetic)?
4. Did you notice any health changes in your child? (For instance, did he or she play the activities learned in class and continue to play at home?)
5. Do you believe your child became more skillful in the game lessons taught?
6. Do you believe your child became more skillful in the dance lessons taught?
7. Do you believe your child became more skillful in the gymnastics lessons taught?
8. Do you believe your child learned more about respect toward others?

Data from the interviews and surveys were qualitatively analyzed using open-axial coding over one semester (Strauss & Corbin, 1998).

**Procedures.** Institutional Review Board (IRB) approval was granted before any contact with participants. Once approved, potential participants were sent an initial recruitment letter through email explaining the purpose of the study and what they could expect

as a participant. Next, parents of the homeschooled students were given a consent form to review and sign. Once parent consent was confirmed, they were asked to complete a survey which asked general questions about their experiences in a physical education opportunity offered at Bridgewater State University during the Fall 2014 semester. These survey responses were then sent back through email for analysis. In addition to parent involvement, parent participants were given a consent form through email for their child[ren] to participate in the study. Subsequently, the children were asked to be interviewed. Prior to each 60-90 minute interview, each child's oral assent was obtained. The children ranged from 7 to 11 years of age. Each interview was conducted at Bridgewater State University where a list of pre-developed open-ended questions were asked, as well as certain follow-up questions used to expand on their answers.

## Results

Four main themes emerged as effects for the homeschooled students and for their families. Homeschooled student effects included 1) a derived enjoyment, and 2) learning in the psychomotor and cognitive domains; mutual benefits for the homeschooled students and their families included 3) respect toward others in the affective domain; and 4) development of a community of friendship.

**Derived Enjoyment.** The homeschooled students derived enjoyment from the physical education experiences. Parent interviews and survey responses about the homeschooled student benefits yielded the following responses: the students were "very energetic and eager to return to class," "after the first gymnastics class, my son asked me to take gymnastics," and, "they were so excited to go to it every week." The enjoyment that emerged with homeschooled students from the physical education experiences continued beyond the walls of the gymnasium, as well. Not only did the homeschooled students enjoy the games, dance, and gymnastics lessons that were taught, but they continued to practice what they had learned at home and enjoyed teaching others as well. One parent noted that she "found [her children] practicing dribbling a basketball in [a sporting goods store], and [she] didn't know they could do that!" Additionally,

another parent stated that "[her] children played some of the similar games at home, practiced dribbling the basketball, dragged the floor hockey equipment out of the garage to practice, etc." During an interview, one homeschooled student expressed her enjoyment by saying that she "came out [of the gymnastics lesson] and was like, 'Wooohoo!'"

### Learning in the psychomotor and cognitive domains.

As a result of the physical education experiences provided, the students improved their overall skill proficiency within games, dance, and gymnastics in the psychomotor domain, as well increased their knowledge base regarding these activities within the cognitive domain. In terms of the psychomotor domain, analysis of parent and student interviews, as well as parent surveys, demonstrated their skill development. One parent noted that "it was hard to do the balance beam in the beginning, but [my daughter] excelled toward the end of the session." Additionally, another parent said, "I think they acquired new skills and skills they already knew were reinforced." After thorough review of recorded physical education class sessions, observation and analysis showed that the homeschooled students did indeed improve their overall skill levels, and some of them even noticed this themselves by expressing their content in learning how to do a headstand, which they previously said was "something [they] could not do." Survey responses indicated that parents agreed their homeschooled students had improved their skill levels, as demonstrated through a response of "yes" to all three skill-level improvement questions.

In terms of the cognitive domain, pre- and post- assessments given to the students during their lessons demonstrated their increased knowledge of movement skills and terminology in games, dance, and gymnastics. For example, during a square dance lesson, an informal teacher assessment was conducted at the beginning of the class when the homeschooled students were shown a video and asked if they could name the following three terms/movements: elbow swing, do-si-do, and promenade. Four out of six homeschooled students did not know all three terms. At the end of the lesson, a formal formative student assessment was given which showed a pic-

ture of the movement and asked the homeschooled students to write the term of the square dance movement underneath the picture. Six out of six homeschooled students knew all three terms. A sample assessment of these square dance terms can be seen below along with the answer key.

**Respect toward others in the affective domain.** Families of the homeschooled students also mutually benefited in two main ways. First, the homeschooled students learned more about respect toward others, which influenced their behaviors at home and outside of the gymnasium. One parent explained that “they realized the importance of good listening and respect to teacher and others because when other children do not listen, it isn’t fair to them.” Additionally, another parent stated that their “children were more obedient to follow instructions at home following the structured physical education classes.” Regarding respect toward others, some parents made comments about how their children “learned to appreciate the

different skill levels.” In these physical education classes, the homeschooled students learned more about inclusion and how to show respect toward others, which the parents saw as a mutual benefit because of their children’s subsequent actions at home, such as “being more able to follow instruction.” Throughout the lessons focused solely on inclusion, the homeschooled students had to work together to complete various tasks; in the process, they learned more about each other and how to care for one another despite individual differences. In a formal formative student assessment given at the end of one of these inclusion lessons, six out of six homeschooled students responded to both questions shown below by circling the smiley face, meaning they understood how to work together and even enjoyed solving problems and physical challenges as a group. This affective assessment can be seen below along with a sample student response.


**Development of a community of friendship.** Another mutual benefit for the homeschooled students and their families,

Name \_\_\_\_\_


### Square Dance

Please label each of these square dance moves using the names in the box below.

Do-si-do
Elbow Swing  
Promenade



---





---

Name ANSWER KEY

### Square Dance

Please label each of these square dance moves using the names in the box below.

Do-si-do
Elbow Swing  
Promenade




---

**PROMENADE**

---

**EL-BOW SWING**




---

**DO-SI-DO**

*Sample assesment of square dance terms (left) an answer key (right).*

aside from learning about respect toward others in the affective domain, was the development of a community of friendship. The physical education experiences created opportunities for the families involved to shape a community of friendship among each other. One parent shared that she thought “it was just nice to talk to other homeschooling parents about their experiences and stuff, too. People [they] don’t normally get to meet.” Furthermore, another parent said that they would “share with their friends some stuff that they were learning” since they “had friends that recommended this physical education opportunity.” A student expressed her positive opinion on creating new friends through this experience and said, “that sometimes I practice some of the new gymnastics skills that I learned with a friend.”

As a result of the physical education experiences, many benefits emerged; including the sense of enjoyment and the development of skills in multiple domains. Additionally, two mutual benefits for the homeschooled students and their families emerged; including learning how to show respect toward others, and finally, the creation of new friendships.

## Conclusion

Results from this study indicated that physical education opportunities with homeschooled students create many positive effects. First, participation in meaningful physical education lessons within the content of games, dance, and gymnastics, may promote a sense of enjoyment which leads to physical activity being present in the homeschooled students’ lives. This study showed that a derived sense of enjoyment was noticeable when given the opportunity to engage in a physical education setting. Second, homeschooled students may increase their knowledge in the psychomotor and cognitive domains. This means that their skill levels will improve, their knowledge surrounding games, dance, and gymnastics will expand, and their overall understanding of the importance of physical activity will help promote it in their daily lives. Similar to previous studies (Journal of College Admission, 2004), the results of this study showed that homeschooled students perform just as well as public school students.

Not only did results indicate positive effects with the homeschooled students, but their families benefited mutually as well. Third, there may be an increase of learning in the affective domain.

Name \_\_\_\_\_

I like working together with everyone in my group. ☺ ☹

I did a good job working together with everyone. ☺ ☹

Name sample \_\_\_\_\_

I like working together with everyone in my group. ☺ ☹

I did a good job working together with everyone. ☺ ☹

*Affective assessment (left) with sample student response (right).*

Homeschooled students may learn more about inclusion and respect toward others; this may influence their actions at home, such as the ability to follow directions or listen to parental guidance. Fourth, the homeschooled students and their families may build a larger community of friendship. Being involved in physical education opportunities allows them to meet more people taking a similar approach to learning which could affect them positively through the creation of new friendships. Similar to previous studies, (Romanowski, 2006), this study showed that homeschooled students, who have the ability to take advantage of this physical education opportunity due to their style of schooling, were able to engage with other families and further develop their social interaction skills. Physical education opportunities for homeschooled students effect both the students and their families in positive ways.

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## About the Author



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# The Characterization of Vectors in $\mathbb{R}^n$ with the Haar Property

TERRENCE KELLEHER

## Introduction

As modern communication becomes more digital than ever, infrastructure tries to maintain an equal pace. Unfortunately, this is not always possible. Therefore, computer scientists and mathematicians alike have endeavored to invent ways to store, send and retrieve data, even if transmitted signals are severely damaged. One such way is by using what is called an error-correcting code, or an ECC. An ECC is a method of encoding information such that a signal that possesses a message can be significantly altered and still be decoded. There are many different types of ECCs. The type that is of interest in this paper depends upon mathematical structures for resilience to inadvertent alteration of a message.

In this paper we will consider the mathematical structure behind one type of error correcting code. Its purpose is to introduce redundancy in the way information is coded so that losses, noises, and erasures to transmitted signals do not prevent accurate reconstruction of information. We represent this process by first letting a given signal be represented by a vector  $\mathbf{v}$  in an  $n$ -dimensional Euclidean space denoted  $\mathbb{R}^n$ . It is worth noting that such vectors will be represented in column-form. Secondly, we consider a representation of the Dihedral group, denoted  $D_{2n}$ , which will act in a linear fashion by matrix-vector multiplication on  $\mathbb{R}^n$ . Next, we say for a fixed vector  $\mathbf{v}$ , the set of all vectors obtained by acting on  $\mathbf{v}$  is called an orbit of  $\mathbf{v}$  and is denoted  $D_{2n}\mathbf{v}$ . Finally, we say a vector  $\mathbf{v}$  has the Haar property if, and only if, every subset of the orbit of  $\mathbf{v}$  of cardinality  $n$  is a basis for the vector space  $\mathbb{R}^n$ . In this paper, we give a characterization of vectors in  $\mathbb{R}^3$  that satisfy the Haar property, and work for similar results in  $\mathbb{R}^5$ . It has been shown that in the  $\mathbb{R}^4$  case, we cannot find the Haar property when examining  $n$  vector subsets. Therefore we modify the Haar property by looking for  $n - 1$  as linearly independent subsets of  $D_{2n}\mathbf{v}$ .

## Preliminaries and Terminology

The Dihedral group,  $D_{2n}$ , consist of the symmetries of a regular polygon with  $n$  sides. Simply put, each of the  $2n$  elements of  $D_{2n}$  represent unique reflections and rotations of regular polygons. For example  $D_6$  is the group containing six elements that correspond to the three unique rotations and three unique reflections of an equilateral triangle. If we were to number each vertex of this triangle, we can represent each rotation and reflection as a rearrangement of these numbers. So in  $D_6$  the element  $\mathbb{R}_{240}$  is the permutation (132). What we mean by permutation (132) is that by rotating an equilateral triangle clockwise 240 degrees, the upper most vertex labeled 1 moves to the lower left vertex labeled 3, the lower right vertex 2 moves to the upper vertex 1, and the lower left vertex 3 moves to the lower right vertex 2. Thus  $D_6$ , and in general  $D_{2n}$ , is the rearrangement of numbers that correspond with the rotations and reflections of a regular polygon.

With this in mind, consider a vector with  $n$  components as our regular polygon, and let  $A$  and  $B$  be rotation and reflection matrices of the form

$$A = \begin{bmatrix} 0 & \cdots & \cdots & 0 & 1 \\ 1 & 0 & \cdots & 0 & 0 \\ 0 & 0 & \ddots & \vdots & \vdots \\ \vdots & 0 & 1 & 0 & \vdots \\ 0 & \cdots & 0 & 1 & 0 \end{bmatrix}, B = \begin{bmatrix} 1 & 0 & \cdots & \cdots & 0 \\ 0 & 0 & \cdots & 0 & 1 \\ \vdots & \vdots & \ddots & 1 & 0 \\ \vdots & 0 & 1 & \ddots & \vdots \\ 0 & 1 & 0 & \cdots & 0 \end{bmatrix}.$$

Then  $D_{2n}$  is the group of matrices which is generated by  $A$  and  $B$  and can be shown by

$$D_{2n} = \{A^j B^k \mid 0 \leq j \leq (n-1), 0 \leq k \leq 1\}.$$

For example let  $n = 3$ . Then,

$$\begin{aligned} D_6 &= \{I, A, A^2, B, AB, A^2B\} \\ &= \left\{ \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}, \begin{bmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{bmatrix}, \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix} \right\}. \end{aligned}$$

Let  $\mathbf{v} = \begin{bmatrix} v_1 \\ \vdots \\ v_n \end{bmatrix} \in \mathbb{R}^n$  and let  $\Theta_{\mathbf{v}}$  be the orbit of  $\mathbf{v}$  which is described as follows.

$$\Theta_{\mathbf{v}} = \left\{ A^j B^k \begin{bmatrix} v_1 \\ \vdots \\ v_n \end{bmatrix} \mid 0 \leq j \leq n-1, 0 \leq k \leq 1, \text{ and } \mathbf{v} \in \mathbb{R}^n \right\}$$

Also let  $(a_1, a_2, \dots, a_n)$  be an  $n$ -tuple such that  $1 \leq a_1 < a_2 < \dots \leq 2n$ . Next let  $M_{a_1, a_2, \dots, a_n} \mathbf{v}$  be a matrix obtained as follows. Fixing an ordering for elements of the Dihedral group such that

$$D_{2n} = \{ \gamma_1, \gamma_2, \dots, \gamma_{2n} \},$$

we have that the  $k^{\text{th}}$  column of  $M_{a_1, a_2, \dots, a_n} \mathbf{v}$  is given by the vector  $\gamma_{a_k} \mathbf{v}$ . To give an example, let  $n = 3$ , and  $\mathbf{v} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ . Then,

$$\begin{aligned} \Theta_{\mathbf{v}} &= \{I\mathbf{v}, A\mathbf{v}, A^2\mathbf{v}, B\mathbf{v}, AB\mathbf{v}, A^2B\mathbf{v}\} \\ &= \left\{ \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}, \begin{bmatrix} 3 \\ 1 \\ 2 \end{bmatrix}, \begin{bmatrix} 2 \\ 3 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 3 \\ 2 \end{bmatrix}, \begin{bmatrix} 3 \\ 2 \\ 1 \end{bmatrix}, \begin{bmatrix} 2 \\ 1 \\ 3 \end{bmatrix} \right\}. \end{aligned}$$

By considering the set  $\Theta_{\mathbf{v}}$ , we observe the matrices

$$M_{3,4,6} \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} = \begin{bmatrix} 3 & 1 & 2 \\ 2 & 3 & 1 \\ 1 & 2 & 3 \end{bmatrix}, \text{ and } M_{1,5,6} \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} = \begin{bmatrix} 1 & 3 & 2 \\ 2 & 2 & 1 \\ 3 & 1 & 3 \end{bmatrix}.$$

are the result of selecting the 3rd, 4th and 6th elements of  $\Theta_{\mathbf{v}}$  and the 1st, 5th, and 6th elements of  $\Theta_{\mathbf{v}}$  respectively, and

making them the columns of a matrix. If every possible matrix whose  $n$  columns are composed of distinct elements of  $\Theta_r$  has linearly independent columns, we say that  $\mathbf{v}$  has the Haar property. It turns out that  $\mathbf{v} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$  is one such example.

### Methods

To determine if a vector has the Haar property we must check the determinant of every  $M_{a_1, a_2, \dots, a_n} \mathbf{v}$ . In the  $\mathbb{R}^3$  case, there are 20 different matrices of this type. To determine whether or not just one vector has the Haar property, we will determine if any of these 20 matrices are linearly dependent by calculating their determinant. In  $\mathbb{R}^4$ , there are 70 matrices, and in  $\mathbb{R}^5$  there are 252 matrices that need to be checked for linear dependence. Given how many calculations go into this process, we have written a routine in Mathematica to do this.

We know that the columns of a square matrix are linearly dependent if and only if its determinant is 0, so we use a program in Mathematica to calculate the determinant of every matrix  $M_{a_1, a_2, \dots, a_n}(\mathbf{v})$ . Using this information, we can determine if a given vector has the Haar property. Using this process, we quickly saw that most randomly selected vectors considered indeed had the Haar property. With this observation we instead began trying to find what vectors do not have the Haar property. In the sections that follow we will find a characterization of vectors in  $\mathbb{R}^3$  that have the Haar property.

### Generalization

Let  $\mathbf{v} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$  be a vector on  $\mathbb{R}^3$ . We define the following set of triples as

$$I = \{(a_1, a_2, a_3) \mid 1 \leq a_1 < a_2 < a_3 \leq 6\}.$$

Thus  $I$  is simply the set of three element subsets of  $\{1, 2, 3, 4, 5, 6\}$  and has cardinality 20. Next, let

$$S = \{\det(M_\alpha \mathbf{v}) : \alpha \in I\}.$$

We observe that elements of  $S$  are polynomials in the variables  $x, y$  and  $z$ . Next, using our Mathematica routine, we are able to compute these polynomials:

$-(x + y + z)(x^2 - xy + y^2 - xz - yz + z^2)$	$(x - y)(y - z)(x + y + z)$
$-(x - z)(y - z)(x + y + z)$	$-(x - y)(x - z)(x + y + z)$
$(x - z)(y - z)(x + y + z)$	$(x - y)(x - z)(x + y + z)$
$-(x - y)(y - z)(x + y + z)$	$-(x - z)(y - z)(x + y + z)$
$-(x - y)(y - z)(x + y + z)$	$-(x - y)(x - z)(x + y + z)$
$-(x - y)(x - z)(x + y + z)$	$(x - y)(y - z)(x + y + z)$
$-(x - z)(y - z)(x + y + z)$	$(x - y)(y - z)(x + y + z)$
$(x - y)(x - z)(x + y + z)$	$-(x - z)(y - z)(x + y + z)$
$-(x - y)(x - z)(x + y + z)$	$(x - z)(y - z)(x + y + z)$
$(x - y)(y - z)(x + y + z)$	$-(x + y + z)(x^2 - xy + y^2 - xz - yz + z^2)$

If we can say that the least common multiple amongst each of these polynomials is non-zero, then we can say none of the above polynomials are equal to zero, and more importantly that  $\mathbf{v}$  has the Haar property. Let,

$$p(x, y, z) = \text{lcm}(S).$$

Then,

$$p(x, y, z) = (x - y)(x - z)(y - z)(x + y + z)(x^2 + y^2 + z^2 - xy - xz - yz)$$

We will use this equation to make claims about  $\mathbf{v} \in \mathbb{R}^3$  in general.

### Results

The following propositions allow for a theorem that characterizes vectors in  $\mathbb{R}^3$  with the Haar property. The work in section 3 leads up to Proposition 1, Proposition 2 allows us to truncate  $p(x, y, z)$ , and Theorem 1 uses these two propositions in its proof.

#### Proposition 1

Let  $\mathbf{v} = \begin{bmatrix} x \\ y \\ z \end{bmatrix} \in \mathbb{R}^3$ , and let  $p(\mathbf{v}) = \text{lcm} \left( \left\{ \det \left( M_\alpha \begin{bmatrix} x \\ y \\ z \end{bmatrix} \right) : \alpha \in I \right\} \right)$ . The vector  $\mathbf{v} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$  has the Haar property if and only if  $p(\mathbf{v}) \neq 0$ .

**PROOF** Suppose  $p(\mathbf{v}) = 0$ . Then there exists at least one factor of  $p(\mathbf{v})$  that is equal to 0. Therefore there exists a matrix whose columns are some collection of  $n$  elements of  $\Theta$ , that are linearly dependent. Therefore  $\mathbf{v}$  does not have the Haar property. Thus by contrapositive, if  $\mathbf{v}$  has the Haar property then  $p(\mathbf{v}) \neq 0$ . Now suppose  $p(\mathbf{v}) \neq 0$ . Then the determinant of  $M_\alpha \mathbf{v}$  is a non-zero polynomial for all  $\alpha \in I$ , where

$$I = \{(a_1, a_2, a_3) \mid 1 \leq a_1 < a_2 < a_3 \leq 6\}.$$

Thus  $\mathbf{v}$  has the Haar property. The next proposition considers one factor of the polynomial  $p(x, y, z)$ .

#### Proposition 2

Let  $x, y$ , and  $z$  be in  $\mathbb{R}$ . If  $y \neq z$ , then  $x^2 + y^2 + z^2 - xy - xz - yz \neq 0$ .

**PROOF** Suppose  $x^2 + y^2 + z^2 - xy - xz - yz = 0$ . By considering this polynomial as a function of  $x$  and rearranging it, we see that  $x^2 - x(y + z) + (y^2 + z^2 - yz) = 0$ . Observe that the discriminant  $d$  of this equation is

$$d = (y + z)^2 - 4(y^2 + z^2 - yz) = -3y^2 + 6yz - 3z^2 = -3(y - z)^2 \leq 0.$$

Note that  $d$  is real only when  $y = z$ . Therefore the only real solution to  $x^2 - x(y + z) + (y^2 + z^2 - yz) = 0$  is when  $y = z$ .  $\square$

This assertion about a factor of  $p(\mathbf{v})$  allows us to refine Proposition 1 and prove Theorem 1.

#### Theorem 1

Let  $\mathbf{v} = \langle x, y, z \rangle$  be a vector in  $\mathbb{R}^3$ . A vector  $\mathbf{v}$  has the Haar property if and only if  $(x - y)(x - z)(y - z)(x + y + z) \neq 0$ .

**PROOF** We want to show that if  $\mathbf{v}$  has the Haar property, then  $(x - y)(x - z)(y - z)(x + y + z) \neq 0$ . Assume that  $\mathbf{v}$  has the Haar property. Then by Proposition 1,  $p(\mathbf{v}) \neq 0$ , and thus  $(x - y)(x - z)(y - z)(x + y + z) \neq 0$ . We now want to

show that if  $(x - y)(x - z)(y - z)(x + y + z) \neq 0$ , then  $\mathbf{v}$  has the Haar property. Since  $(x - y)(x - z)(y - z)(x + y + z) \neq 0, y \neq z$ . Therefore by Proposition 2,  $x^2 + y^2 + z^2 - xy - xz - yz \neq 0$ , and  $\mathbf{p}(\mathbf{v}) \neq \mathbf{0}$ . ■

Notice that from the first three factors that describe vectors with the Haar property in Theorem 1, we see that none of  $x, y$ , or  $z$  can be equal. In addition, if we examine the last factor  $(x + y + z)$ , we see that no component can be equal to the negative of the sum of the other components.

**Future work**

In addition to the characterization of vectors in  $\mathbb{R}^3$ , we consider vectors in  $\mathbb{R}^4$  and  $\mathbb{R}^5$ . All definitions and notations are the same for  $\mathbb{R}^4$  and  $\mathbb{R}^5$  as they are for  $\mathbb{R}^3$ , and any differences will be articulated.

**When  $n = 5$**

It has been shown by Oussa (2015) that vectors with the Haar property exist in  $\mathbb{R}^n$  when  $n$  is prime. Thus the case for

when  $n = 5$  is not any different than the case for when  $n = 3$  in terms of our assumptions. Let  $\mathbf{v} = \begin{bmatrix} u \\ w \\ x \\ y \\ z \end{bmatrix} \in \mathbb{R}^5$ , and let

$$K = \{(a_1, a_2, a_3, a_4, a_5) \mid 1 \leq a_1 < a_2 < a_3 < a_4 < a_5 \leq 10\}.$$

Then  $T = \{\det(M_\alpha \mathbf{v} : \alpha \in K)\}$  which is a set of polynomials in the variables  $u, w, x, y$ , and  $z$ .

Thus the least common multiple of T is as follows:

$$\begin{aligned} & (u+w+x+y+z)(u^2-w^2-ux+wx-uy+xy+wz-xz)(uw+wx-x^2-uy-yy+y^2- \\ & wz+xz)(uw-w^2-ux+wx-uy+y^2+uz-yz)(u^2+wx-x^2-uy-yy+xy-uz+yz)(u^2- \\ & uw+xy-y^2-uz+wz-xz+yz)(w^2+ux-x^2-uy-uz-wz+xz+yz)(u^2-uw-ux+wx- \\ & yy+wz+yz-xz)(uw+ux-x^2-uy+xy-uz-wz+xz)(ux-wx+wy+xy-y^2-uz-xz+ \\ & z^2)(uw-w^2-uy+yy+xy-xz-yz+xz)(u^2w^2-uw^3+u^3x-2u^2wx+um^2x-u^2x^2+w^2x^2+ \\ & ux^3-wx^3-u^2wy+u^2xy-umxy-w^2xy+ux^2y+2umy^2-uxy^2+2wxy^2-uy^3-wy^3-xy^3+ \\ & y^4-u^3z+u^2wz+w^3z+3umxz-2m^2xz-2ux^2z+wx^2z-umyz+w^2yz-uxyz-wxyz- \\ & x^2yz+2uy^2z-wy^2z+2xy^2z-y^3z+u^2z^2-2umz^2-w^2z^2+uxz^2+x^2z^2-uyz^2+wyz^2+wz^3-xz^3)(u^4-u^3w-u^3x+2u^2wx-w^3x-umx^2 \\ & +w^2x^2-u^3y-u^2wy+um^2y+w^3y+2u^2xy-umxy+wxy^2-x^3y+umy^2-w^2y^2-uxy^2+x^2y^2+wy^3-u^3z+2u^2wz-um^2z-u^2xz- \\ & umxz+w^2xz+ux^2z-2wx^2z+x^3z+2u^2yz-umyz-2w^2yz-uxyz+3wxyz+xy^2z-y^3z+ \\ & w^2z^2+uxz^2-x^2z^2-uyz^2+wyz^2-2xyz^2+y^2z^2-wz^3+xz^3)(uw^3-w^4+u^3x-2um^2x+w^3x- \\ & u^2x^2+umx^2+u^2wy-2um^2y+w^3y-u^2xy+umxy+w^2xy+2ux^2y-wx^2y-x^3y-u^2y^2- \\ & wxy^2+x^2y^2+uy^3-xy^3-u^3z-u^2wz+um^2z+w^3z+umxz-2w^2xz-ux^2z+x^3z+2u^2yz+ \\ & umyz-2w^2yz-3wxyz+wxyz-uy^2z+wy^2z+2xy^2z+u^2z^2-umz^2+2uxz^2+wxz^2-x^2z^2- \\ & xyz^2-y^2z^2-uz^3+yz^3)(u^3w-u^2w^2+um^3+u^2wx+um^2x-umx^2-ux^3-wx^3+x^4-u^3y- \\ & 2um^2y-umxy-w^2xy+2wx^2y+2wxy^2-x^3y+u^2y^2+umy^2+w^2y^2-uxy^2-wy^3-2u^2wz- \\ & w^3z-u^2xz-umxz+2ux^2z+2wx^2z-x^3z+u^2yz+3umyz+w^2yz-uxyz-wxyz-x^2yz- \\ & 2uy^2z+xy^2z+y^3z+u^2z^2+umz^2+w^2z^2-wxz^2-2wyz^2+xyz^2-y^2z^2-uz^3+yz^3)(u^3w- \end{aligned}$$

$$\begin{aligned}
& u^2w^2 - u^2wx + 2uw^2x - w^3x - u^2x^2 + w^2x^2 + ux^3 - wx^3 - u^3y - uw^2y + w^3y + 2u^2xy - 3uwxy - \\
& ux^2y + 2wx^2y + u^2y^2 + 2uw^2y - w^2y^2 - wxy^2 - x^2y^2 - uy^3 + xy^3 + uw^2z + u^2xz + uwxz - w^2xz - \\
& wx^2z - u^2yz + uwyz + uxyz + wxyz + x^2yz - uy^2z + wy^2z - 2uwz^2 - 2uxz^2 + wxz^2 + uy^2z - \\
& 2wy^2z - 2xy^2z + uz^3 + wz^3 + xz^3 + yz^3 - z^4)(u^4 - u^3w + u^2w^2 - uw^3 + w^4 - u^3x + 2u^2wx + \\
& 2uw^2x - w^3x + u^2x^2 - 3uw^2x + w^2x^2 - ux^3 - wx^3 + x^4 - u^3y - 3u^2wy + 2uw^2y - w^3y + 2u^2xy - \\
& uwxy - 3w^2xy + 2ux^2y + 2wx^2y - x^3y + u^2y^2 + 2uw^2y + w^2y^2 - 3wxy^2 + 2wx^2y + x^2y^2 - uy^3 - \\
& wy^3 - xy^3 + y^4 - u^3z + 2u^2wz - 3uw^2z - w^3z - 3u^2xz - uwxz + 2w^2xz + 2ux^2z + 2wx^2z - x^3z + \\
& 2u^2yz - uwyz + 2w^2yz - uxyz - wxyz - 3x^2yz + 2uy^2z - 3wy^2z + 2xy^2z - y^3z + u^2z^2 + 2uwz^2 + \\
& w^2z^2 + 2uxz^2 - 3w^2z^2 + x^2z^2 - 3wyz^2 + 2xy^2z + y^2z^2 - uz^3 - wz^3 - xz^3 - yz^3 + z^4).
\end{aligned}$$

It is clear that this polynomial is much more complicated than in the  $\mathbb{R}^3$  case so we may have to reconsider how it is that we approach finding general characterization of vectors in  $\mathbb{R}^n$  for  $n > 3$ . Although we didn't generalize the Haar property for these vectors, we were able to make the following observations.

From extensive computations it appears that if any three components of  $\mathbf{v}$  are equal,  $\mathbf{v}$  does not possess the Haar property. However, if at most two components are equal,  $\mathbf{v}$  may or may not have the Haar property. As this project continues into the future, we will examine the least common multiple of  $M_\alpha \mathbf{v}$  where  $\mathbf{v} \in \mathbb{R}^5$ , and  $\alpha \in K$  and work to characterize vectors with the Haar property in  $\mathbb{R}^5$ .

#### When $n = 4$

It has also been shown by Oussa (2015) that no vector in  $\mathbb{R}^n$  for even values of  $n$  have the Haar property. Thus, when

considering vectors in  $\mathbb{R}^4$ , we have to redefine the Haar property. Let  $\mathbf{v} = \begin{bmatrix} w \\ x \\ y \\ z \end{bmatrix} \in \mathbb{R}^4$  and let  $U =$

$\{(a_1, a_2, a_3) \mid 1 \leq a_1 < a_2 < a_3 \leq 8\}$ . We say that  $\mathbf{v} \in \mathbb{R}^4$  has the modified Haar property if for all  $\alpha \in U$ ,  $M_\alpha \mathbf{v} \neq \mathbf{0}$ .

Since these matrices will now be  $4 \times 3$ , we cannot calculate the determinant as in the  $\mathbb{R}^3$  case. We will now construct a new method for doing so.

#### Calculating determinants

Let  $X = M_\alpha \mathbf{v}$  where  $\mathbf{v} = \begin{bmatrix} w \\ x \\ y \\ z \end{bmatrix} \in \mathbb{R}^4$ , and  $\alpha \in U$ . In order to compute the independence of the columns of every  $X$ , we

calculate the determinant of each matrix generated by  $X^T X$ . By multiplying each  $X$  by its transpose, we get a square  $3 \times 3$  matrix whose determinant is computable. We claim that if  $\det(X^T X) = 0$  for every  $\alpha \in U$ , then the vectors of  $X$  are linearly independent, and thus  $\mathbf{v}$  has the modified Haar property.

**LEMMA** Let  $X$  be an  $m \times n$  matrix with  $m < n$ . Then  $\det(X^T X) = 0$  if and only if the vectors of  $X$  are linearly dependent.

**PROOF** Suppose  $\det(X^T X) = 0$ . Then we know that the null space of  $X^T X$  is not trivial. That is there exists a  $\mathbf{v} \neq \mathbf{0}$

**PROOF** Suppose  $\det(X^T X) = 0$ . Then we know that the null space of  $X^T X$  is not trivial. That is there exists a  $v \neq 0$  such that  $X^T X v = 0$ . If we multiply this equation on the left by  $v^T$  we have  $v^T X^T X v = v^T X^T X v = (Xv)^T Xv = \|Xv\|^2 = 0$ . Since  $\|Xv\|^2 = 0$ , we know that

$\|Xv\| = 0$ , and  $Xv = 0$ . Since  $v \neq 0$  and in the null space of  $X$ , the columns of  $X$  must be linearly dependent.

Now suppose that the columns of  $X$  are linearly dependent. Then we know there exists a  $v \neq 0$  such that  $Xv = 0$ . Next we consider  $X^T X v = X^T (Xv) = X^T (0) = 0$ . Since  $X^T X v = 0$ , and  $v \neq 0$  the columns of  $X^T X$  must be dependent and  $\det(X^T X) = 0$ .

In summary, we have a method to show the linear independence of the columns of  $X$  despite it not being a square matrix. By using our Mathematica routine we can calculate the LCM of  $\det(X^T X)$  which comes out to

$$\begin{aligned}
 & 2 (u-y)^2 (x-z)^2 (u^2+x^2-2uy+y^2-2xz+2z^2) \\
 & (u^2+x^2+2uy+y^2+2xz+2z^2) \\
 & (u^4+x^4+2u^3y-2ux^2y+2u^2y^2+2uy^3+y^4-2u^2xz+2x^3z-8uxy-2xy^2z+2x^2z^2-2uyz^2+2xz^3+z^4) \\
 & (u^4-2u^2x^2+x^4+2u^3y-2ux^2y+2u^2y^2+2x^2y^2+2uy^3+y^4-2u^2xz+2x^3z-8uxy-2xy^2z+2u^2z^2+2x^2z^2-2uyz^2-2y^2z^2+2xz^3+z^4) \\
 & (u^6-u^4x^2-x^2u^4+x^6-u^4y^2+10u^2x^2y^2-x^4y^2-u^2y^4-x^2y^4+y^6-8u^3xy-8ux^3y-8uxy^3-8u^4z^2+10u^2x^2z^2-x^4z^2+10u^2y^2z^2+10x^2y^2z^2-8uxyz^2-u^2z^4-x^2z^4-y^2z^4+z^6)
 \end{aligned}$$

Although less complicated than the previous cases, we still have to consider an alternative method for further insight into vectors in  $\mathbb{R}^4$  with the Haar property. Regardless, there are some claims we can make with the use of computation alone.

It has been discovered that when certain components of  $v \in \mathbb{R}^4$  are equal,  $v$  does not possess a modified Haar property,

but when others are equal,  $v$  may possess a modified Haar property. For instance, given a vector  $v = \begin{bmatrix} w \\ x \\ y \\ z \end{bmatrix} \in \mathbb{R}^4$ , if  $x = y$ ,

$v$  has the modified Haar property, but if  $w = y$ , then we do not have the modified Haar property. This is a surprising contrast from  $v \in \mathbb{R}^3$  where we showed no component of  $v$  may be equal. Future work will concentrate on finding a full characterization of vectors in  $\mathbb{R}^4$  with the modified Haar property.

### Conclusion

Ultimately least common multiple for when  $n = 4$  and  $n = 5$  involve several factors which are massive and extremely difficult to factor into a form from which we can make characterizations about  $v$ . The focus of this project moving forward will be to find ways to truncate the least common multiple of the determinants in the same way we did for when  $n = 3$  and make characterizations for vectors that have the Haar property when  $n$  is odd or the modified Haar property when  $n$  is even. It is likely that the methods used to characterize vectors in  $\mathbb{R}^3$  will not be applicable to the larger values of  $n$  due to their complexity, so we will also explore alternative methods to find a solution.

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## About the Author



Terrence Kelleher is graduating in May 2016 from Bridgewater State University with a Bachelor's of Science in Mathematics with a concentration in Pure Mathematics and a minor in Statistics. His research project was made possible by the Adrian Tinsley Program summer research grant in 2015. Terrence and his mentor Dr. Shannon Lockard (Mathematics) answered a question provided by Dr. Vignon Oussa, also of the BSU Department of Mathematics. Terrence presented this research at the 2016 Joint Mathematics Meetings in Seattle, Washington, an opportunity afforded to 200 students chosen from a large pool of applicants from across the nation. Terrence has a passion for learning and imparting that passion to others. Therefore he hopes to become a professor someday.



# The Relationship Between Circadian Dysfunction and Cognitive Impairment in Individuals with Parkinson's Disease

ANDREW LEONARD

## Abstract

Parkinson's Disease (PD) is a brain disorder associated with a variety of motor (e.g., rigidity, tremor) and nonmotor (e.g., cognitive impairment, sleep dysfunction) symptoms. Recent evidence suggests that PD patients may also have dysfunctional circadian rhythms: oscillators responsible for many behavioral and physiological functions (e.g., sleep-wake cycle, cognitive performance). No study to date has measured both circadian rhythms and cognitive functioning in the same group of PD patients. This was the aim of the current project. The archival data set included 34 PD patients and 12 normal control participants (NC) matched by age and education. Cognition was measured through a series of neuropsychological tests measuring memory and executive functioning. Archival circadian rhythm data, collected through watch actigraphy, was analyzed using three nonparametric variables: relative amplitude (RA), interdaily stability (IS), and intradaily variability (IV). Higher RA and IS values indicate a more stable rhythm, while higher IV values indicate a less stable rhythm. Patients with PD had significantly higher RA values

than NCs; however, there was no significant difference between PDs and NCs in IS or IV values. There was a significant positive correlation between executive functioning and RA and IS values in PDs. No significant correlations were found between executive functioning and IV values or between working memory and RA, IS, or IV values among PDs. This preliminary evidence suggests that disrupted circadian rhythm in PD patients may be related to cognitive impairment. Future research should investigate this potential link by using additional and more sophisticated circadian rhythm measures. This, in turn, could shed more light on the role circadian rhythm dysfunction plays in the cognitive impairment of PD patients and thus, highlight the potential need for new treatment and intervention strategies aimed at improving the quality of life of these individuals.

## The Relationship Between Circadian Dysfunction and Cognitive Impairment in Individuals with Parkinson's Disease

Parkinson's disease (PD) is an incurable neurodegenerative brain disorder. Approximately one million Americans have PD; about 40% developed the disease between the ages of 50 and 60 (National Parkinson's Foundation, 2015; Parkinson's Disease Foundation, 2015). Although the cause of PD is unknown, the pathology of the disease is associated with the death of dopamine neurons (National Parkinson's Foundation, 2015). PD symptoms are characterized by both motor (e.g., tremor, rigidity, abnormalities of movement) and non-motor (e.g., cognitive impairment, sleep abnormalities) impairments (Rodriguez-Oroz et al., 2009); however, diagnosis is based on the presence of motor symptoms (National Parkinson's Foundation, 2015). Non-motor symptoms (NMS) are the biggest factor in determining a PD patient's quality of life (Martinez-Martin, 2011). Despite their significance, NMS are often overlooked by clinicians and researchers (Chaudhuri, Odin, Antonini, Martinez-Martin, 2011), making them an important area of focus for future research efforts.

Evidence suggests that PD patients may also have dysfunctional circadian rhythms (Willison, Kudo, Loh, Kuljis, & Colwell, 2013; Videnovic & Golombek, 2013). Circadian dysfunction

results in a variety of widespread symptoms in the general population, including cognitive impairments, metabolic abnormalities, and sleep/wake/arousal disturbances (McDonald, 2002), similar to many of the NMS observed in PD. One question, therefore, concerns whether the NMS seen in PD occur due to circadian dysfunction. Although a theoretical link exists between circadian dysfunction in PD and NMS (Willison et al. 2013; Videnovic & Golombek, 2013), few studies have explicitly examined this relationship. Because of the important role cognitive functioning plays in life's most basic functions, of interest to this study will be its potential relationship to circadian dysfunction in PD, specifically executive functioning and memory, two areas of cognitive impairment which have also been directly linked to the circadian system (Valdez, Reilly, & Waterhouse, 2008).

Cognitive impairments are seen in approximately 19%-38% of newly diagnosed, untreated PD patients (Dirnberger, & Jahanshahi, 2013). Some studies have shown executive functioning and memory to be the cognitive areas where PD patients show the most impairment (Verbaan et al., 2007). Executive dysfunction, in particular, may be the most documented cognitive impairment in PD (Dirnberger & Jahanshahi, 2013). It is imperative for functioning in daily life, particularly in non-routine tasks that require inhibitory control and conflict resolution. Working memory is considered part of executive functioning and is broken down into two components which consist of visuospatial (visual) and phonological (verbal) systems (Valdez et al., 2008). Working memory's functions are essential for many of life's daily tasks (e.g., speech, reading and writing, processing images; Valdez et al., 2008). PD patients also exhibit deficits in recognition and recall memory (Whittington, Podd, & Stewart-Williams, 2006). Recall memory is accessing memories previously stored in the brain, and recognition memory is associating an event or an object with a previous experience; impairment in either of these can lead to a significant decline in quality of life. While executive functioning and memory impairments have been well-documented in PD, they have also been directly linked to the circadian system.

The circadian system is made up of oscillators throughout the brain and body and is responsible for many behavioral and

physiological functions (e.g., sleep-wake cycle, endocrine and autonomic systems, neurotransmitter activity, task performance) and processes (Hofstra & de Weerd, 2008). The central clock of the circadian system, found in the suprachiasmatic nucleus (SCN) of the hypothalamus, is responsible for regulating these independent oscillators of the circadian system (Shanahan & Czeisler, 2000). Disruption of this system is thought to have widespread implications, many of which overlap with the NMS seen in PD patients (e.g., sleep-wake disturbance, cognitive and psychiatric deficits, cardiovascular problems). Because of this overlap, coupled with the knowledge that NMS are present well before motor symptoms, it has been hypothesized that circadian dysfunction is not merely a byproduct of other PD symptoms, but instead a core component of PD pathology (Willison et al., 2013).

In normal functioning, the circadian system has been linked to specific cognitive functions such as recognition and recall memory (processed by the hippocampus), with evidence pointing to an important relationship between the SCN and the hippocampus (Smarr, Jennings, Driscoll, & Kriegsfeld, 2014), and executive functioning (processed by the prefrontal cortex). For instance, both types of working memory, verbal and visual, have been documented as having circadian rhythms, with the lowest level of performance occurring early in the morning (4:00-7:00 am), and highest performance seen in the early afternoon. (Valdez et al., 2008). The circadian system is thought to run on an approximately 24.3 hour cycle in humans (Waterhouse, 2010), with cognitive functioning levels paralleling other circadian processes such as arousal/alertness, rest/activity levels, and the sleep/wake cycle. In other words, a person with circadian dysfunction may exhibit lower levels and duration of peak activity and arousal than those with normally functioning circadian rhythms, and because levels of cognitive performance tend to run parallel to these parameters, that same individual is more likely to experience impairments in cognitive functioning. While there is research to suggest there are links between circadian disruptions and cognitive performance, there has yet to be a study that objectively measures circadian rhythm and cognitive performance in PD patients.

This is the aim of the present project.

In the present project, archival data in Boston University's Vision and Cognition Laboratory were used to examine the relationship between circadian disruptions and cognitive impairment in working memory and executive functioning in PD and control participants. Hypotheses for this project include the following: 1) PD patients, when compared to healthy control participants, will perform more poorly on a series of cognitive assessments; 2) PD patients, when compared to healthy control participants, will show less stable circadian rhythm patterns; and 3) less stable circadian rhythms among PD patients will be correlated with poorer performance on the cognitive assessments.

## Method

### Participants

This project examined archival data from a prior study of 34 non-demented individuals with PD (21 men and 13 women) and 12 normal control (NC) participants (6 men and 6 women). PD patients were recruited from the Movement Disorders Clinic at the Boston University School of Medicine and control participants from the local community. All participants gave informed consent and were matched for age (PD:  $M = 66.38$ ,  $SD = 7.9$ ; NC:  $M = 62.17$ ,  $SD = 9.3$ ),  $t(44) = -1.52$ ,  $p = .14$ , and education (PD:  $M = 16.71$ ,  $SD = 2.4$ ; NC:  $M = 17.17$ ,  $SD = 2.4$ )  $t(44) = .57$ ,  $p = .57$ . This study was approved by the Boston University IRB.

### Measures and Procedures

Participants wore Actiwatch AW-64 wrist actigraphs for a continuous period of one week in order to extract real-time rest-activity data. From this, circadian rhythm parameters were derived using MotionWare software (CamNtech, Cambridge, UK) and analyzed using SPSS (IBM Corp, 2013). Three non-parametric variables were used to measure circadian rhythm: relative amplitude (RA), interdaily stability (IS), and intradaily variability (IV). For executive functioning, the neuropsychological tests used included digit span backwards, Trail Making Test B, Stroop Color-Word Test,

verbal fluency (FAS and category-animals), and RUFF figural fluency. For recognition and recall memory, tests included the California Verbal Learning Test-II (CVLT-II) and the Brief-Visual Memory Test (BVMT). Each measure is described in more detail below.

*Circadian rhythm measures actiwatch AW-64.* An actigraph worn on the wrist was used to monitor activity levels in participants for sleep, circadian rhythms, pain, drug response, or many other applications. Participants wore the actigraph, continuously, for one week. The Actiware 5.3 (Mini-Mitter) software was used to organize and analyze data gathered from the Actiwatch AW-64. To extract and analyze circadian rhythm data from the actigraph data, three non-parametric measures were chosen based on their utilization and validation in previous studies: interdaily stability, intradaily variability, and relative amplitude (Whitehead, Davies, Playfer, & Turnbull, 2008; Goncalves, Cavalcanti, Tavares, Campos, & Araujo, 2014; Goncalves, Adamowicz, Louzada, Moreno & Araujo, 2015).

*Interdaily Stability (IS)* is used to measure how synchronous the rest/activity patterns are between individual days. To calculate IS, the variance of the average daily rest/activity profile of each participant is divided by the total rest/activity variance (Goncalves, Adamowicz, Louzada, Moreno & Araujo, 2015). A higher IS value indicates a more stable rhythm. *Intradaily Variability (IV)* is used to indicate the fragmentation of rest/activity rhythms through measurement of how frequent and to what extent the transitions from rest periods to activity periods are in each 24 hour period. IV is calculated by the ratio of the means squares of the first derivative and its population variance (Goncalves, Cavalcanti, Tavares, Campos, & Araujo, 2014). Higher IV values indicate more frequent and/or larger transitions and therefore a less stable rhythm. *Relative Amplitude (RA)* is the ratio of the most active 10 hours to the least active 5 hours in an average 24-hour period. A higher RA value indicates a more stable rhythm. RA is thought to give an even more comprehensive embodiment of amplitude than other non-parametric measures (Hatfield et al., 2004).

### Executive Functioning Measures.

*Digit Span Backward.* In this task, the experimenter reads a

string of digits and the participant then immediately repeats them in reverse order. There are two sets of numbers per series length. Once the set of numbers is repeated correctly, the tester moves on to the next set. The total score corresponds with the longest number of digits repeated backwards correctly.

*Trail Making Test B.* This task consists of 25 circles distributed over one sheet of paper (Reitan, 1958). The circles are alphanumeric, with numbers ranging from 1-13 and letters ranging from A-L. The participant is asked to draw a line connecting each circle in an ascending order, while alternating numbers and letters (1-A-2-B-3-C...). The final score is based on the time necessary to complete the test.

*Stroop Color-Word Test.* In this task (Stroop, 1935), the participant is asked to name the color of the word that is on a piece of paper; for instance, the word “blue” may be printed in red ink. The correct answer would be “red” in this particular example. Scoring is dependent on how many colors the participant is able to correctly name within 45 seconds. The Stroop interference score is calculated by the difference in delay times of naming incongruent and congruent colors on the color-word test. A lower score indicates less interference when faced with incongruent words.

*Verbal Fluency Task (FAS and Category-Animals).* In this verbal fluency test (Delis et al, 2001; Delis et al., 2004), individuals are given three one minute time periods to come up with as many words beginning with each of the letters F, A, and S (FAS) and as many animals (Category-Animals) as they as the can in a one minute period. This is an executive function task in which the number of words and clustering, (using similarly sounding words), are measured.

*Ruff Figural Fluency.* In the Ruff Figural Fluency Test (RFFT), each participant is given a test booklet with 5 different timed parts. The participant is asked to draw as many unique designs as he or she can within 60 seconds for each of the 5 parts, by connecting dots in different squares provided in each section. Results are measured by how many unique designs are created by the participant (Ruff et al., 1987).

## **Recognition and Recall Memory Tests.**

*California Verbal Learning Test-II (CVLT-II).* Different parts of this test measure different aspects of memory (Delis et al., 2000). For immediate recall, 16 words from 4 categories are presented to the participant. Each person is then asked to remember as many as possible in 5 consecutive efforts. For long recall, after 20 minutes have passed, the participant is asked to recall as many words as possible from the list of 16 originally presented to him or her. Finally, in the recognition trial, the participant is shown a list of words and asked which ones were on the original list.

*Brief Visuospatial Memory Test (BVMT).* In three learning trials, the participant is given a recall stimulus page with six geometric figures to look at for ten seconds (Cherner et al., 2007). The individual is then asked to draw as many of the figures as he or she can. After 25 minutes, the task is repeated. The participant is then asked to identify which of the 12 figures were included in the six geometric figures on the original recall stimulus page.

## **Data Analysis**

Summary scores in each cognitive domain (executive functioning, working memory) were calculated by using z-scores based on the means of NCs from each neuropsychological test and then averaging them. PD and NC performance was then analyzed using a series of between group t-tests. For each t-test, group was the independent variable and summary scores for either cognitive domain were the dependent variables. The two groups were also compared on the three non-parametric circadian rhythm variables using t-tests mentioned above. Correlational analyses were used to examine the relationship between cognitive performance and circadian rhythm performance for each group.

## **Results**

### **Cognitive Assessments**

Independent samples t-tests were performed to examine group differences on individual cognitive assessments given to participants, as well as summary scores calculated for two cognitive

domains (executive functioning and working memory; see Table 1). Consistent with this study's hypothesis, analysis of cognitive task results revealed that PD patients performed significantly more poorly than NCs on multiple measures, including overall summary scores for executive functioning and working memory. Specifically, PD patients performed more poorly on the FAS letter and category fluency tests, trail making test B, Ruff figural fluency test, Stroop color word, CVLT-II total learning test, CVLT-II short delay test, CVLT-II long delay test, BVMT total learning test, BVMT long delay test, and BVMT recognition test. Significant differences in test results were not found between groups on the WAIS-III digit span backwards test, Stroop interference, or CVLT-III recognition test.

### **Circadian Rhythm Assessments**

Independent samples t-tests were also performed to examine group differences with respect to the variables chosen to measure circadian rhythm stability (i.e., RA, IS, and IV). Results from circadian rhythm measures only partly supported the hypothesis that PD patients would show less stable rhythms than the NC group. Analysis showed a statistically significant difference in RA values between NC ( $M = .94$ ,  $SD = .03$ ) and PD ( $M = .88$ ,  $SD = .10$ ) groups,  $t(44) = 1.87$ ,  $p < .007$  (see Figure 1). There was not a statistically significant difference shown in IV values between NC and PD groups;  $t(44) = .60$ ,  $p = .55$ , nor was there a statistically significant difference found in IS values between NC and PD groups;  $t(44) = 1.76$ ,  $p = .09$ .

### **Correlations between Circadian Rhythm and Cognition**

Pearson correlation tests were performed to examine the relationship between circadian rhythm dysfunction in PD patients, as measured by the circadian variables RA, IS, and IV; and executive functioning and working memory summary scores among PD patients. Results only partially supported my hypothesis that less stable circadian rhythms would be correlated with poorer performance on cognitive assessments.

There was a positive correlation between summary scores

for executive functioning ( $M = -.57$ ,  $SD = .61$ ) and RA values ( $r = .41$   $p < .02$ ; see figure 2); as well as IS values ( $r = .35$   $p < .04$ ). No significant correlation was found between the PD group's executive functioning summary scores and IV values among PDs ( $M = .02$ ,  $SD = .09$ ) ( $r = -.02$   $p = .92$ ).

There was not a significant relationship seen between working memory summary scores ( $M = -.92$ ,  $SD = .77$ ) and RA ( $r = .14$   $p = .43$ ); IS ( $r = .12$   $p = .49$ ); or IV values ( $r = .05$   $p = .78$ ).

### **Discussion**

This study examined the potential relationship between circadian rhythm dysfunction and cognitive impairment. The first hypothesis, stating that PD patients would perform more poorly than NCs on cognitive assessments, was mostly consistent with previous literature. PD patients performed more poorly on the majority of cognitive assessments, including summary scores for both executive functioning and working memory. Executive functioning deficits in PD patients has been widely evidenced in the literature (Zgaljardic et al., 2006; Verbaan et al., 2007; Stavitsky, Nearing, Bogdanova, McNamara, and Golomb, 2011; Dirnberger & Jahashi, 2013), while multiple studies have found evidence of PD patients having deficits in both executive functioning and working memory (McKinlay, Grace, Dalrymple-Alford, & Roger, 2010; Varanese, Perfetti, Ghilardi, & Di Rocco, 2011). PD patients showed poorer performance than NCs in the current study on Stroop color-word and Ruff figural fluency, which is consistent with the study by Miller and colleagues (2013), while they also performed more poorly on three of the four CVLT-II assessments, similar to deficits seen in CVLT-II assessment results from PD patients in Varanese and colleagues (2011) study.

The second hypothesis predicted that PD patients would exhibit less stable circadian rhythms than NCs. This hypothesis was only partially supported, as PD patients showed a less stable rhythm in terms of RA, but not in terms of IS or IV values. This is inconsistent with some of the literature. For example, as in the current study, RA values were shown to be lower (less stable) in PD patients than healthy controls in Whitehead and colleagues (2008)

study; however, in the same study, they also found that PD patients showed significantly higher IV values than healthy, age-matched controls, unlike what was found in the present study. Because there is a lack of research into circadian dysfunction in PD patients, it is not possible to understand definitively why this difference in IV exists. However, it has been shown that IV can be higher in older adults and is also more likely to be affected by age-related changes than the other variables used in this study (Huang et al., 2002). The mean age of PD patients in this study was 66.38 and the mean age of healthy controls was 62.17, while the mean age of PD participants in Whitehead and colleagues (2008) study was 73.36 and the mean age of healthy controls was 70.90. Whether or not PD patients have a higher likelihood of increased IV values (i.e., a more fragmented rhythm) as they age compared to similarly-aged healthy adults, and hence explains the different results, is worth examining. In addition, the disease could have progressed further in the PD patients from Whitehead and colleagues' (2008) study, than in the current one due to the age differences, possibly accounting for the difference in IV values. Because Whitehead and colleagues' (2008) study was the only one found examining PD patients' circadian rhythms using non-parametric methods, additional studies examining the age-related differences in IV values of PD patients is warranted.

There was not a significant difference in IS values between the PD and NC groups, which is consistent with much of the literature using nonparametric methods. For example, although Whitehead and colleagues (2008) found a significant difference in IV, there was not a significant difference in IS between the groups. This is also consistent with findings that IS is not affected by age. In fact, it has been shown that older adults often have higher, and therefore more stable, IS values (Huang et al., 2002). It has also been suggested that the regularity in which PD patients often have to take their medications and/or get treatment may act as additional zeitgebers, synchronizing agents for the circadian system (e.g., sleep/wake cycle, light/dark cycle, meal times). This, in turn, could make their days more synchronous, stabilizing IS values (Whitehead et al., 2008).

The third hypothesis, that a less stable circadian rhythm

would be correlated with poorer performance on cognitive assessments among PD patients, was only partially supported as well. RA and IS were positively correlated with executive functioning summary scores, however, IV was not correlated with executive functioning. In addition, working memory was not correlated with RA, IS, or IV. A possible explanation for this could be that working memory could be less affected by disruptions in circadian functions than other executive tasks.

### **Limitations**

One limitation of this study is of the inability to control exogenous factors such as meal times, light exposure, and schedule of activities, which can all act as zeitgebers and have an effect on the entrainment of circadian rhythms. Although not practical, an ideal study would control all of these factors. Suggested methods for this include a forced desynchrony protocol in which participants sleep for very long or short cycles, designed to bring out the circadian system's free running period. Other methods used include constant routine, bed rest, and multiple nap protocols (Wirz-Justice, 2007). Past studies examining circadian rhythm have also looked at variables such as melatonin secretion and core body temperature to measure circadian rhythm (Kräuchi, 2002; Bordet et al., 2003; Weinert & Waterhouse, 2007). Using these additional variables in order to strengthen the validity of circadian rhythm analysis would lend more strength to the current and future findings.

### **Conclusion**

The present study examined the relationship between circadian rhythm dysfunction and impairments in executive functioning and working memory in PD patients. PD patients performed significantly more poorly in both cognitive domains. They also showed a less stable rhythm in terms of RA, but not in IS or IV. Among PD patients, RA and IS were positively correlated with executive functioning. Preliminary evidence from this study suggests that disrupted circadian rhythm in PD patients could be related to cognitive impairment. Gaining a better understanding of the role

**Table 1.** Cognitive performance of NC and PD groups.

	NC (n = 12)	PD (n = 34)	Significance
Executive Functioning Summary Score	-.007 (.43)	-.57 (.61)	.005
Verbal			
Letter Fluency (FAS)	57.58 (11.68)	39.50 (10.29)	.001
Category Fluency	54.92 (13.31)	45.03 (10.69)	.013
WAIS-III Digit Span Backward	9.16 (2.85)	7.79 (2.43)	ns
Visual			
Trail Making Test B (seconds)	65.20 (17.51)	119.0 (64.14)	.001
Ruff Figural Fluency	90.42 (23.28)	75.67 (16.25)	.021
Stroop Interference (index score)	-4.86 (6.36)	-4.28 (5.98)	ns
Stroop Color Word	39.08(8.43)	31.09(9.86)	.017
Working Memory Summary Score	.055 (.47)	-.918 (.76)	.001
Verbal			
CVLT-II total learning	57.42 (10.41)	42.81 (13.09)	.001
CVLT-II short delay	12.25 (2.96)	8.28 (3.25)	.001
CVLT-II long delay	12.5 (3.58)	9.37 (3.69)	.016
CVLT-II recognition	14.67 (1.50)	14.09 (1.78)	ns
Visual			
BVMT total learning	24.0 (6.51)	16.5 (6.55)	.002
BVMT long delay	9.67 (2.87)	7.31 (3.23)	.032
BVMT recognition	6.0 (0.0)	5.12 (.91)	.001

Note: Means (SD) are reported. NC = normal control; PD = Parkinson's disease; TMT = Trail Making Test; WAIS-III = Wechsler Adult Intelligence Scale III; CVLT-II = California Verbal Learning Test-II; BVMT = Brief Visual Memory Test; ns = not significant

circadian rhythm may play in cognitive impairment is important due to the negative impact both can play in an individual's quality of life.

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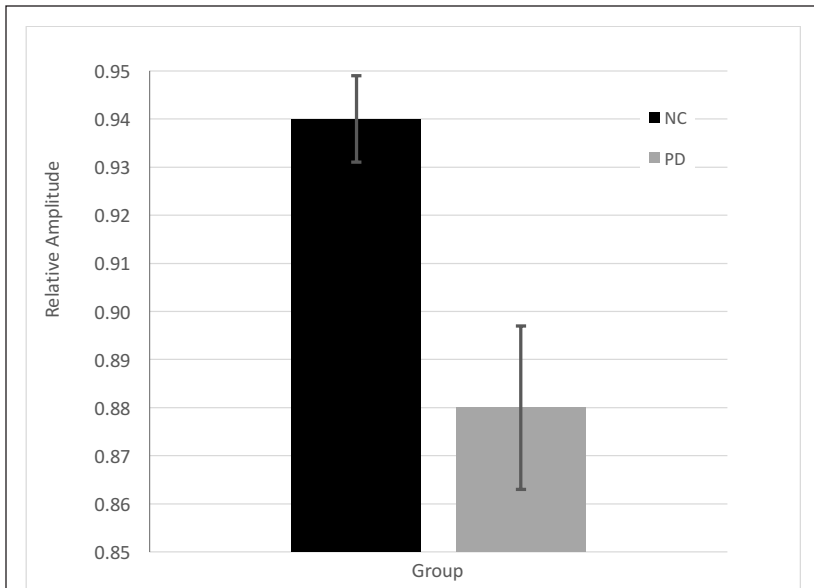


Figure 1. Bar graph displaying the difference in relative amplitude (RA) between participant groups. PD patients had significantly lower RA values ( $M = .88, SD = .10$ ) than NCs ( $M = .94, SD = .03$ ). A lower RA value suggests a less stable circadian rhythm.

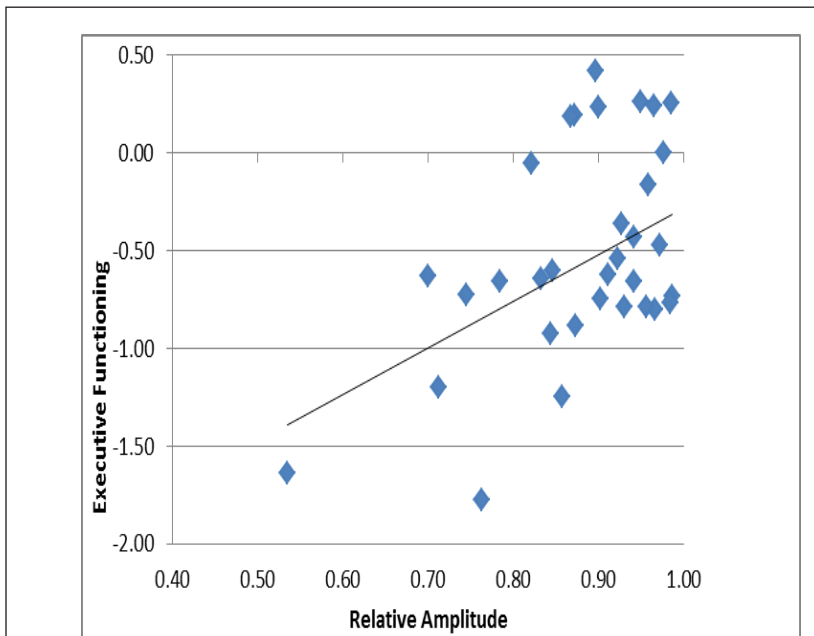


Figure 2. Scatterplot of relative amplitude (RA) and executive functioning summary scores. Results showed a significant positive correlation between the two variables ( $r = .41, p < .02$ )

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## About the Author



Andrew Leonard is a dual major in Psychology and Social Work graduating in May 2016. His research, mentored by Dr. Sandra Nearing (Psychology), began in the summer of 2015 with funding from an Adrian Tinsley Program summer research grant. Andrew plans to attend graduate school to earn a Master of Social Work degree.

# No Man's Land

LAURIE MATHEWS



**M**y main objective was to create stone and metal work that reflects my concern for the future of humanity, the natural world, and the unalterable interdependence between the two. Stone—with its natural grains and flaws that can be reduced through extensive polishing and refinement—can also act as a metaphor for the innate corruption of humans and their ability to right or redeem themselves. Stone, raw and unadulterated, forces me as an artist to work with nature in a tangible way and reinforces the message I hope to convey—the unalterable juxtaposition between humans and nature that can neither be denied nor ignored.

Working with stone also allows me to relinquish a certain degree of control over my work. With stone, I have to allow for unexpected flaws or cracks that may force revisions and alterations as I work. In my view, this unpredictable and tenuous quality acts as an asset not a hindrance, since it forces me to accept and work with aspects of the medium that I cannot change. Throughout the creative process, my aim is to stay open to any changes necessary as I work with a particular stone.

I find that, as I transfer from one medium to another, the work usually shifts and changes in response. In this work I transitioned between stone and metal. I like to explore ways to manipulate metal by using heat to create a patina or by using a plasma cutter to fragment the metal to the point of becoming almost threadbare. As I move back and forth between mediums, the work begins to speak to me in ways I had not anticipated when I first conceived of it in my mind. As a result, I find that it is vital for me as an artist to maintain a sense of openness to unexpected changes while working. Without that openness the artist may feel constricted, stifled, and uninspired—trapped into doing something that screams for abandonment or movement in another direction.

I find that one of the most exciting aspects of creating an art piece, especially a sculpted piece, is the point when the piece begins to take on a very clear and decisive form and a personality of its own. At that point, all that is left is the removal and refinement of excess material, allowing for the piece to become distinct and actualized. Very rarely have I created a complex work that has remained true to

its original idea or model. As a result, I am mindful of the wording in any artist statement, so that the statement leaves room for further interpretation or change of view. It should remain applicable and as true as possible over time, especially because art should be studied and viewed multiple times in order for one to fully experience and appreciate the subtleties, complexities, and distinctions involved. Continual analysis of the piece gives the viewer, along with the artist, the opportunity to relate to the piece on a deeper level of understanding. I know that I respond to a work more fully with repeat contact and viewing.

My hope is to produce work that reflects not only my current knowledge and skills, honed through my studies and personal experiences, but also my point of view about social and environmental issues. Due to early events in my life, I believe I have acquired sensitivity to the pain and suffering of others. As a child, I was forced to move from one location to another because of my father's job. By my final year in high school, I had attended over a dozen schools. As a rather shy and introverted child, a condition I still struggle to overcome, I often entertained myself by studying others as an outsider. In order to survive, I became something of an expert on picking up on subtle clues, such as fleeting glances and unspoken exchanges. I then began to incorporate these aspects of human exchanges in much of my art, which included portraits. I was especially drawn to a fleeting expression in someone's eyes that many times revealed the condition of the innermost self or soul. In my works of expressive portraiture, I have spent many years using pastels, watercolors, charcoal, mixed media, pen and ink, and pencil. My work has ranged from representational realism to abstractions and has involved experimentation with variations of depth, color, line, and shape in order to create a sense of expression or feeling. In such works my aim is to capture the essence of a person, a deeper version than the one out front.

While sculpting, I often find that the piece speaks to me. As it begins to take on a certain form, new ideas and feelings emerge and this adds new meaning that I had not originally considered. As I begin working on an organic piece, whether with stone or metal, I try

to work with the medium, not against it. I find that any peculiarities or inconsistencies in the material provide inspiration and add to its overall attractiveness. To me, this is one of the most exciting aspects of sculpting—developing a relationship with the piece as I work, exploring, refining, and redefining the piece. I am especially appreciative of the beautiful and natural characteristics of alabaster. Each piece includes infinite variations in color and translucence, in its deposits of salts and iron oxides, and in its veins and banding. The variations provide further inspiration and help to move me forward as I work.

My intention is to create both figurative and abstract pieces that contain elements of discomfort and incongruity. I attempt to translate in sculptural form a sense of imbalance and visual tension. I hope that my work becomes increasingly minimalist and abstract. Although detailed work—including transitioning from clay models to another medium, such as stone—allows me to develop my skills of observation, that kind of work is a great place to start, not to finish. Ultimately, my intent is to create only abstract rather than representational pieces.

The greatest challenge for me this year was to create work that allows the conscious mind to take a back seat to the unconscious. Too often in life all the blanks are filled in, leaving nothing to the imagination. I like the challenge of working with stone since this medium allows for the creation of elegant, graceful, and flowing lines. The organic and swelling shapes that stone produces can attract and seduce the senses of the viewer. Incorporating swelling shapes and fluid elements works to draw in the viewer in order to deliver any kind of message the piece might convey to them. As an artist, I am motivated by a sense of personal and global responsibility as I work, and I hope that some of these feelings are translated into each piece I create. These concerns include the need for the protection of the earth's air and water and a need to look more closely at the plight of humanity, as we become increasingly invisible and voiceless in today's world.

I derive inspiration in my work through various artists, including Maya Lin, Ernst Barlach, Kathe Kollwitz, Pablo Picasso,

and Umberto Boccioni, as well as from writers and musicians such as Isaac Bashevis Singer, John Steinbeck, David Gray, Citizen Cope, and many others. Listening to music is essential as I work. I am usually keyed in to one musician at a time, listening to an entire body of a work over and over again until my piece of art is completed. Music has a way of keeping me in a certain mindset or mood that acts to drive ideas and ensure that I stay focused and inspired.

I find contemporary sculptor and architect Maya Ling Lin's work notable due to her innate sensitivity to the subtle textures, flow of lines, and purity of forms that are found in nature—forms that are simple, elegant and graceful. Her work is not didactic, but rather it appeals to human beings' primal attraction to all that is sublime and truthful in the natural world. In her autobiography, *Maya Lin: Boundaries*, Lin explains, "In choosing to make works that do not force a set opinion or message forward but present facts that allow viewers to come to their own conclusions—creating meditative spaces that seem almost too subtle in their design, yet have a quiet teaching method or approach—I recognize a distinctly Asian influence" (Lin 503). Lin's work inspires me in much the same way. It helps me to appreciate the simplicity and minimalism found in nature that I also hope to communicate through any art that I produce. I am attracted to abstractions, rather than actual representations where everything is spelled out. An artist shouldn't have to connect all the dots for the viewer. I am always striving and searching for ways to express my point of view through this minimalist approach to art. In my view, art should be open-ended, always leaving room for changing views and interpretations that usually become increasingly complex over time.

Lin's vision involves seeing nature as a whole and sometimes the disturbing loss of an essential part of nature. In her exhibit *Here and There*, she creates a white Vermont Danby marble carving entitled *Disappearing Bodies of Water* that depicts the Arctic ice mass, Lake Chad, and the Aral Sea. In this piece, she attempts to show gradual changes in this body of water over time: "The shape of each layer of marble is derived from the satellite image of the shrinking mass of the body of water. As climate change accelerates, Lin is increasingly interested in rising currents and changes at the

water's edge" ("Maya Lin" 2). Currently, Lin is working on what she calls her "last memorial," entitled *What's Missing?* It is a ten-year, multi-sited project that has brought art into the twenty-first century through the use of the website [www.whatismissing.net](http://www.whatismissing.net). According to a Pace London press release, the website "...acts as a nexus for the project, creating an ecological history of the planet and inviting people to share something they have personally witnessed diminish significantly or disappear from the natural world" ("Maya Lin" 2).

Through the website, Lin engages the viewer in a way that is unprecedented by asking the viewer to log on and report environmental changes that are occurring in neighborhoods and communities throughout the world. Her approach to the environment seems to mirror my own philosophy, that one person can change the world and that no voice is too small to be heard. Lin takes art and environmental activism to a new level, through the use of the Internet as an essential tool. This gives her work immediacy and intimacy, through the documentation of changes in the earth's ecology as they occur and by instilling a personal sense of responsibility in the individuals viewing the change. Lin's *What's Missing* project allows community activists, such as myself, to provide a piece of evidence about a problem that might otherwise have gone unnoticed or been dismissed by the casual observer.

My artistic journey also involves a sense of social responsibility, as well as an environmental one. I have been greatly influenced by Expressionist works, especially German Expressionism as depicted in the work of German sculptor Ernst Barlach. Barlach's work portrays human suffering in the face of war and its aftermath. His dynamic figures, often carved in wood, depict exaggerated gestures. The figures are also highly stylized—with geometric patterns of dress and very detailed faces and hands—and are shockingly lifelike and powerful. Barlach's work creates a sense of both drama and movement, as he successfully captures the emotional aftermath of war and its psychological and physical tolls on its victims. Before leaving Germany, Barlach was portrayed as one of Germany's "degenerate" artists by Adolph Hitler. His work was cited in Hitler's "Munich Degenerate Art Exhibition" as an example of

immorality and the antithesis of Nazi ideology, and 381 of his works were removed from exhibition in German museums (Lucie-Smith 75).

The universal human experience of suffering transcends both time and space. In Herschel Chipp's journal article, "German Expressionism in Los Angeles," he states, "There are also, inevitably, the metamorphoses in the highly personal modes of expression of these [German Expressionist] artists, who are so acutely sensitive to the changing pressures of social struggles" (Chipp 2). In my work I also hope to capture a contemporary social awareness and heightened sensitivity to the suffering of others as it is experienced on a personal level. These forces act to inspire and drive my vision. As an undergraduate student of art, I am sometimes required to move backward in order to move forward. I am expected to provide, in an academic sense, evidence of my understanding of form, especially human form. Although abstract work is my ultimate goal, initially I must prove my competency and skill as an artist in the traditional sense.

As a case in point, Pablo Picasso's initial representational work is a sharp contrast to his later work. In Pierre Daix's book, *Picasso: Life and Art*, Picasso is described as a child prodigy: "... visiting an exhibition of children's drawing with Antonina Vallentin, Picasso told her that at twelve he could not have entered the show, because by then, he already 'drew like Raphael.' Today we have proof of that remark" (Daix 6). Although Pablo Picasso's work is now so well known that some may consider it a cliché, I feel that his work is still very relevant today and a source from which I continue to draw inspiration. I am inspired by Picasso's imaginative diversity and playfulness and his manipulation of space, line, and color. Partly due to a lifelong exposure to his very popular Cubist paintings, his work has had a strong influence on my way of seeing and working with clay and other malleable mediums. I have long been drawn to his simple and minimalist style. I find his freshness and originality to be unmatched by most of today's contemporary artists. His work also inspires me to strive to find my own voice and view so that I have something new to depict and say.

Although a great source of inspiration for much of my work has been the art and ideas of the past, I am constantly searching for new sources of inspiration. My goal is to move forward as an artist and not allow myself to be stuck with what is familiar and comfortable but, instead, to challenge myself, take risks, and possibly fail. Complacency is not acceptable to me. The artists I most admire are those who have pushed beyond societal norms and self-imposed limits in order to create something new, something wonderfully exciting, and sometimes, something painfully true.

The methods, materials, and ideas of past and present artists, especially sculptors, have provided me with both knowledge and inspiration. In his book, *Living Masters: A Sculptor's Handbook*, Oliver Andrews says "Stone has been used for sculpture for thousands of years. Although it may seem today to be eclipsed by the dazzling array of modern materials, it still holds a fascination for some of the most creative contemporary sculptors" (Andrews 107). As I begin to explore stone as my primary medium of choice, I begin to appreciate its versatility and its unique, natural features. Although I enjoy working with the mediums of paint and pen and ink, stone speaks to me in a way that is different from the other mediums. I was first introduced to stone carving during my second year at Bridgewater State University. Although I sometimes find the hand tools involved in working with stone to be difficult and cumbersome—using angle and die grinders and a wide variety of one-quarter-inch carbide bits—I am hooked on everything associated with the medium.

As long as I can remember, I have had a fascination with stones and rocks. While at the shore, I can spend hours collecting and examining stones, noting how they change after the tide rushes in, compared to how they look when they are baking in the sun. I love studying their various patterns and colors, and running my hands over their smooth textures and shapes. When I was a child, my mother gave me her collection of rocks, left over from a university geology class. This collection was soon to be one of my greatest treasures, each rock labeled and classified according to its physical properties. My favorites were those that had embedded crystals that would shimmer as you held them up to the light.

Stone sculpture, one of the oldest art forms known to humankind, tells the tale of ancient civilizations and how the creative spirit has endured through time. Although I appreciate the historical significance of ancient art and feel that it's a relevant part of my work, modern sculpture, which had its beginnings between World War I and World War II, is where I focus most of my attention. I have been influenced by German Expression, Futurism, and Cubism and by artists such as Kathe Kollwitz, Ernst Barlach, Alberto Boccioni, Jacques Lipchitz, Picasso, Henri Moore, Constantin Brancusi, Jean Arp, and Maya Lin.

German Expressionist artists Ernst Barlach and Kathe Kollwitz lived in an atmosphere of constant threats as they worked. As Hitler rose to power in the 1930s, artists who opposed his views lived in constant fear. They not only feared for their safety, but also feared that their work, which included war memorials and other public sculptures, would be destroyed. Barlach, on a national radio show called "Artists on Their Times," defended artistic freedom just days before Hitler was appointed German Chancellor. According to the book, *An Artist Against the Third Reich: Ernst Barlach, 1933-1938*, "Barlach called attention to the conflict between two races – a conflict 'as old as the world' and demanded, 'in defiantly outspoken partisanship,...that those pushed into a corner be given freedom to breathe'" (Paret 23).

Barlach worked with a variety of mediums, but according to Paret, he "...liked to sculpt by carving directly from wood, and in his forties he took up the woodcut as a favored medium – both methods often associated with 'primitive art' – and contributed to the expressionist attribution..." (25). However, Paret said that Barlach was not comfortable with the term "expressionist": "As a classification of a phase in the history of art, expressionism has value; but the term is subject to too many qualifications and exceptions to be of much use as an interpretive device. Calling Barlach an expressionist has not added to the understanding of his work – nor, perhaps, to the understanding of expressionism" (26).

During a 1937 exhibition of "degenerate art" in Germany, sponsored by Hitler as an assault on avant-garde German artists,

Barlach's sculpture *The Reunion* was selected in order to publicly humiliate him (28). Although much of Barlach's work is figurative, the pieces seem to propel themselves forward into space and almost linger there, as if anticipating something dire that is soon to take place. The sharp geometric forms, found in the figure's robes and cloaks, add to this sense of movement and dynamism, something often seen in Futurist paintings.

Paret paraphrases a man named Walter Hinderer, who had noted of Barlach that his sculptures were "...characterized by a combination of abstraction and imagery, by the idealization of reality. The realistic element of the particular is reduced so that the artist can formulate a general truth..." (28). Barlach's figurative sculptures, especially his woodcarvings, seem to portray the essence of "common" people facing a future of fear and uncertainty. At the same time, Barlach also manages to reveal the innate resilience and enduring inner strength of people during such times.

In the book *Jacques Lipchitz: The First Cubist Sculptor*, author Catherine Putz writes of Picasso that his "...sculptural constructions were driven by a fascination with structure which sculptors had no need to emulate: it was already part of their craft, intuitively apprehended as much as learnt. More important was the impetus cubist painting gave to sculpture before the First World War toward developing an infinitely variable language, one that could suggest a more complex experience of the world than could traditional artistic practices" (Putz 10).

The minimalist shapes and forms, associated with ancient artwork and dating back to pre-Columbian times, heavily influenced many avant-garde sculptors in the first half of the twentieth century. They were also inspired by African wood masks and began producing carvings that veered from traditional representative work and moved toward more abstract representations. In her book *Contemporary Stone Sculpture: Aesthetics Methods Appreciation*, Dona Z. Meilach says, "An important idea in the development of sculpture was [Henri] Moore's concept of penetrating the material and opening up the sculptured mass. Now sculpture not only penetrated space, but space also penetrated the sculpture. He brought solids and voids into

equal and harmonic balance" (Meilach 18). Artists such as Moore, Arp, Brancusi, and Lipchitz, among others, began to revolutionize sculpture in a way that is still relevant and appreciated today. Their vision was one of unadulterated form, and their sensitivity to spatial relationships helped propel art in a new direction at a time when contemporary sculpture's very existence was in peril.

Today, artists such as Maya Lin also use their art to send a message to the viewer. In some of Lin's most recent work, modern technology comes screaming to the forefront. She implements global mapping, GPS tracking, and an interactive website as important elements of some of her most recent and compelling work. According to a 2013 press release by Pace London, the fourteen foot-long marble sculpture *Greenwich Mean Time* represents the cartographic section of the Greenwich Meridian, the parallel passing through London at zero degrees longitude. To create the sculpture, Lin began with drawings...followed by computer analysis and scaled models to find the right form... "I start with extremely complex scientific data points and then, through a visual editing process, I find the scale and simplicity of the form—revealing a landscape both visually discernable and compelling." ("Maya Lin" 2)

Lin's latest work includes aerial views of disappearing bodies of water, taken from satellite images and three-dimensional modeling, in order to show depth and area as well as temporal changes that are occurring on the planet at a steady rate. She seems to question whether these changes are permanent and, if so, whether they will worsen. Lin also incorporates materials such as steel pins, liquid recycled silver, and marble in many of these pieces. In a quote from the Pace London Lin explains that "If the end form looks only like the idea of the information, then it fails. It has to become its own form—evocative, beautiful, strange" ("Maya Lin" 2).

Although many of the artists I have discussed lived in different time periods and faced different challenges, they were linked by an overwhelming desire to reach beyond what is known and to explore the unknown, even in the face of being publicly ridiculed. Contemporary artists such as Maya Lin are also finding a way to merge science and technology with art. They are creating sculptural



works that visually depict what many choose to ignore. They are making a strong appeal to our senses and our collective conscience. And they are reminding us of what is important and what is really happening.

As an artist, I look forward to the challenges that lie ahead in the search for new and richer meanings in my life and in the world of art. Although I may be considered a quiet and soft-spoken person, I am someone with strong opinions as well as deep convictions and concern for others. I hope to use art as a fluid platform for expressing these personal views and insights. In my work with metal, stone, and other mediums, I am moving toward a place where I will be free to explore limitless possibilities and challenges—to a place of vision and purpose. My ultimate goal is to create work that challenges the viewer to see things in a new way, or at least that poses questions and concerns about the world and the people around us.

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## About the Author

Laurie Mathews is a graduating senior majoring in Art with concentrations in Fine Arts/Sculpture and Art Education. She is looking forward to a future in art education as well as continued work in sculpture and mixed media. Her alabaster stone projects were completed in the 2014-2015 academic year under the guidance of Professor Ryan Collins.

# Effects of a 10-Week Periodized Resistance-Training Program on Speed-Performance in Male High School Athletes

BROOKE PACHECO

For successful performance as a team sport athlete, strength, speed, and endurance abilities are of high importance. Since the requirement profile for field sports like soccer and football requires peak performance in at least two of these abilities, it is essential for pre-season training programs to employ training methods that address the sport-specific physiological abilities that are most dominant in that particular team sport. For example, the requirement profiles for football and soccer show the importance of both strength and speed abilities. During a game, football and soccer players alike repeatedly perform many tasks, such as linear and change-of-direction sprinting, requiring strength as well as speed and strength combined (i.e., power). These tasks make substantial contributions to scoring and defending and can contribute significantly to the outcome of the game. When it comes to high school sports, however, the question becomes what type of pre-season resistance-training program would most benefit players when they take the field in competition. Generally, fall high school athletes have a short time to train for their sport, 10-12 weeks during the summer. The question is, will a 10-week, resistance-training program be long enough to have an impact on strength and speed before the start of regular season play?

Existing research on the effectiveness of short-term resistance training on strength and speed is both limited and conflicting. Hoffman and Kang (2003) conducted a 15-week strength and conditioning program for 53 Division-III collegiate football players that showed no significant improvements in performance on the T-test, a standard measurement of change-of-direction (COD) speed. An 8-week study by Tricoli et al. (2005) that looked at the short-term effects of lower-body functional power development on speed variables on 32 young men also showed no significant improvements in COD speed. However, an 8-week study on 26 athletic men by McBride et al. (2002) found significant improvements in COD sprint times after both heavy- and light-load squat training.

In research related to the effectiveness of various types of strength-training programs on motor performance, there is evidence to suggest that periodized resistance training (PRT) programs are the safest and most beneficial way for coaches to prepare their athletes for competition (Jimenez, 2009). The goal of PRT is to manipulate the training volume and intensity in phases so athletes can reach their highest potential by the end of the training period. With proper manipulation of the training variables, athletes will not only peak at the appropriate time for competition, but the potential risk for injury or overtraining will be reduced (Hoffman, 2003).

A focused literature review of PRT by Jimenez (2009) found that most studies mainly examined strength training with young males as their subject population and focused on the differences between periodized and non-periodized programs. The review concluded that the scientific literature encouraged researchers and exercise professionals to use periodization models during resistance training and conditioning programs. Jones et al. (2009) conducted a 9-month study of PRT on exercise equipment using 38 subjects that did not show improvements on COD speed. However, Keiner et al. (2013) conducted the longest intervention in the literature with a two-year study testing 132 elite youth soccer players examining the effects of a PRT intervention on COD performance. Results of the study showed that the long-term PRT program (i.e., greater than 15 weeks) had a positive effect on the performance of COD speed variables.

Along with these findings, the Keiner et al. (2013) study also showed a significant correlation between relative maximum strength and sprint speed. Sprinting speed depends on both strength and power of the muscle contraction to drive the arms and legs in order to give an athlete the capacity to achieve high speeds (Hoffman, 2003). Starting power is important for athletes on the playing field who need to cover a given distance in the shortest amount of time from a still position. A defensive end, for example, must be able to generate maximum force at the beginning of his movement, when muscle contractions create initial speed, in order to get to the quarterback as quickly as possible. Accelerating power, the capacity of an athlete to increase speed and to achieve high speeds, certainly benefits most team-sport athletes from wide receivers in football to strikers in soccer. Starting power and accelerating power both rely on strength to generate speed.

Findings in the literature are inconsistent in studies investigating strength and combined speed-strength or power parameters, especially involving COD speed. Several have found a medium to high correlation between absolute (as opposed to relative) muscular strength and sprint performance measurements. Hori et al. (2008) and Requena et al. (2009) both showed a clear influence of strength training on acceleration and sprint speed of 29 semi-professional rugby players, where a study by Harris et al. (2000) showed no significant effect of high-power, high-force, or combined weight-training methods on power in 42 trained men.

It was the intent of this study to conduct further research on strength training and COD speed, with particular interest in whether a 10-week (short-term) periodized resistance-training program would improve relative strength and COD speed in male high school athletes. This study also aimed to determine if there was a correlation between relative strength and speed.

## Methods

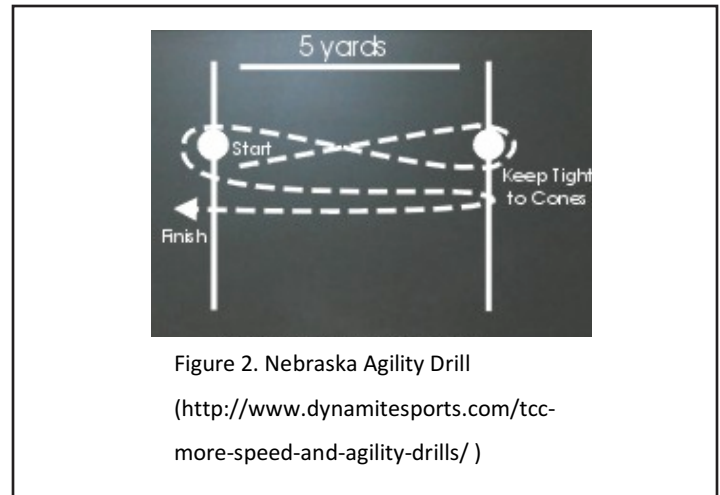
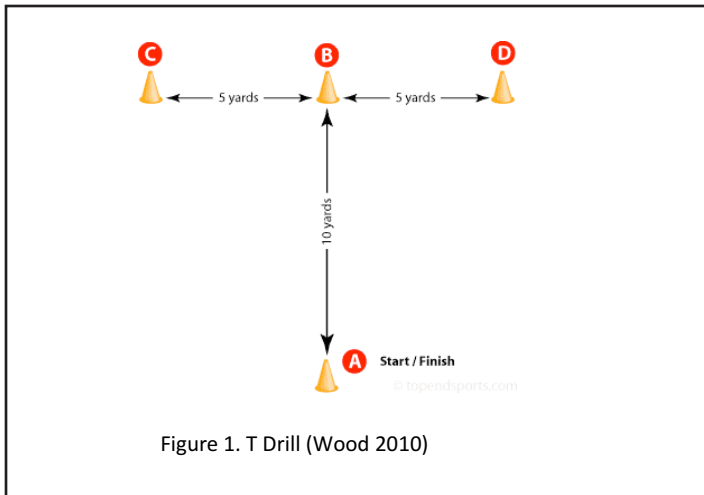
*Participants.* Eighteen athletes familiar with strength-training/conditioning exercises and medically cleared to participate in their pre-season training programs volunteered for this study. Males

were specifically recruited because the protocol for the 10-week training program required heavy-load lifting that they had previously been trained to perform. Females were not chosen because they were not familiar with the exercises, and their training protocol would have been introductory based. Football and soccer players were chosen for the study because both sports require players to have the physiological abilities of strength, power, and speed for successful performance on the playing field. In addition, high school athletes who participate in these respective fall sports are traditionally limited to pre-season, summer-training programs that span approximately 10-12 weeks in length. The participants were recruited from Coventry High School in Rhode Island because the athletic facilities were equipped with the necessary training tools, and the athletic department already had a strength and conditioning program in place.

*Instruments.* Three speed-related performance tests were administered to establish speed ability baseline scores: the “T Drill” (Figure 1), the “Nebraska Agility” drill (Figure 2), and a 20-meter dash. The T Drill uses a combination of change-of-direction sprinting and side shuffling. The Nebraska Agility Drill uses a combination of change-of-direction sprinting and backpedaling. The 20-meter dash measures linear forward sprinting.

All three tests mimic movement patterns that are used on both the football and soccer field. In each speed test the athlete attempted to complete the test as quickly as possible, and the test administrator recorded the athlete’s time. A three-repetition maximum (3RM) back squat was used as a baseline measurement for strength. The 3RM was chosen because it is one of the safest exercises for the age group and is considered one of the most reliable measures of lower body strength (Urquhart et al., 2015). Pre and post tests were administered on the playing fields, and the training program was conducted in the weight room at Coventry High School.

To begin the training program each subject was given a periodized resistance-training packet based on the results of their 3RM back squat and bench press (Table 1). The training packet was divided into three phases, with each phase lasting three weeks in duration: the Hypertrophy Phase (H-Phase), the Strength Phase



(S-Phase), and the Power Phase (P-Phase). Pre and post tests rounded out the 10-week program. This type of program was chosen because multiple studies in the literature (Kamandulis et al., 2012; Keiner et al., 2014) have reported positive changes in speed when using periodized resistance training.

Each of the three phases in the protocol built upon the previous phase with planned, systemic variations in exercises, intensity, and volume in order to address the various physiological needs of each participant. The primary objective of the H-Phase was to prepare the participants for the more strenuous training they experienced in the subsequent phases. The S-Phase was designed to “ramp up” the intensity of training where both the sets and the intensity increased while the repetitions decreased. Finally, the P-Phase exercises were performed with greater attention to the athlete’s sport and position on the field of play to provide greater opportunity for strength carryover.

A variety of isotonic and isometric exercises, as well as single- and multi-joint movements, were performed. Primary lifts consisted of power cleans, split jerks, hang cleans, back squats, front squats, bench presses, dead lifts, and Bulgarian split squats, which were consistent throughout all three phases (Table 1). Multi-joint movements were chosen as primary lifts because they provide potential to develop both muscular strength and power. Secondary lifts were chosen to supplement the primary lifts by engaging all

muscle groups and promoting a full-body workout (Table 2).

#### Procedures.

Prospective participants for the study were notified of the opportunity to enroll through the athletic director, football and soccer coaches, the training coordinator, and the head strength coach at Coventry High School. Prospective participants attended a meeting where information was provided about the study, questions were answered, and parental/participant consent forms were distributed. Interested athletes who could not commit to the entire 10 weeks of training (including pre and post testing) or who recently had a sport-related injury were not eligible to participate. All participants or their parents signed a university IRB-approved consent form prior to participation in the study. Once consent was obtained the 18 male participants were divided into two groups. Athletes able to commit to three sessions per week were assigned to the periodized resistance training group (PRTG) to create the best scenario for compliance. Other athletes who were interested in participating but could not commit were assigned to the control group (CG). Nine athletes participated in the periodized resistance-training intervention (PRTG), and the other nine participated in the control group (CG) and performed pre-season training on their own.

All participants in both the PRTG and CG were pre and post tested over a few days (constituting “the 10th week” of the

H-Phase			S-Phase			P-Phase		
(A) Clean Progression			(A) Clean Progression			(A) Clean Progression		
(B) Hang Clean	%	WT	(B) Hang Clean	%	WT	(B) Power Clean	%	WT
5	LT		3	LT		3	LT	
5	LT		3	LT		2	LT	
5	MOD		3	MOD		2	MOD	
5	MOD		3	MOD		1	HVY	
5	MOD		3	MOD		3x1	HVY	
(C1) Back Squat	%	WT	(C1) Back Squat	%	WT	(C1) Back Squat	%	WT
8	50%		4	70%		3	68%	
8	60%		4	77%		2	75%	
8	65%		4	82%		1	85%	
8	70%		4	85%		1	92%	
8	70%		4	85%		3x1	97%	
(C2) Seated Hurdle Hops 4x5			(C2) Vertical Med Ball Sq. Throw 4x5			(C2) Squat Jumps 4x6		
(D1) BB Bench Press	%	WT	(D1) BB Bench Press	%	WT	(D1) BB Bench Press	%	WT
8	50%		4	70%		3	65%	
8	60%		4	77%		2	75%	
8	65%		4	82%		1	85%	
8	70%		4	85%		1	92%	
8	70%		4	85%		3x1	97%	

Table 2

*Phase by Phase Progression of Secondary Lifts*

(D2) Med Ball Chest Throw 4x5	(D2) Med KNL Ball Chest Throw 4x5	(D2) Explosive Push Ups 4x6
(E) Incline DB Press 2xMax Reps (MOD)	(E) Incline DB Press 2xMax Reps (MOD)	(E) Incline DB Press 1xMax Reps (MOD)
(F1) DB RDL 4x8 (HVY)	(F1) DB RDL 4x8 (HVY)	(F1) DB Bench Press 1xMax Reps (MOD)
(F2) DB Skullies/Press 3x10 (MOD)	(F2) DB Skullies/Press 3x10 (MOD)	(F2) DB Reverse Fly 3x10 (MOD)
(F3) DB Hammer Curl 3x10 (MOD)	(F3) DB Hammer Curl 3x10 (MOD)	(F3) Hip Flips 4x4

study). Participants were given two trials for each drill with 5-minute rest periods between each trial and 20-minute rest periods between each of the three drills. All participants were instructed on how to perform the drills before the test trials began. The order of participation remained the same for all three tests and before each second trial, and the participants were told their previous score. Two trial recorders timed each participant using stopwatches. The slowest time between the two timers was used for each trial, and then the fastest time between the two trials was used as their final test score. For each participant, the T Drill was performed first, followed by the Nebraska Agility Drill, and finished with the 20-meter dash.

To obtain a baseline measurement for strength, each participant performed a three-repetition maximum back squat (3RM) following the three speed tests. This number was then used in the Brzycki equation to calculate their 1-RM. After review of the literature, this equation was used because it is considered one of the more attractive alternatives for estimating 1 repetition values and has satisfied the validation criteria established by the literature (Nascimento, 2007). All participants were reminded of the proper form and execution of the back squat before testing began. Participants were also weighed on a calibrated scale. Body weight was used later to calculate their relative strength. All procedures were duplicated during post testing.

Participants in the PRTG were required to train three days per week from May 18 to July 24. Each session lasted approximately 90 minutes, with a 15-minute warm-up of light jogging and stretching and a 10-minute cool down. PRTG participants were divided into three groups based on their level of strength and ability. In order to maximize training efficiency and safety in the weight room, levels were determined by knowledge of exercises, competence in performing exercises, and their absolute strength measurement. All participants performed the same exercises, but the intensities varied among them based on the amount of weight they could lift. Everyone was instructed on proper form and execution of lifts as well as proper spotting techniques. Participants had rest periods between sets and recorded the weight lifted in the space provided

on their training packet. Attendance was taken daily. If a participant missed a session they were required to make it up on their own time. If participants consistently missed sessions without making them up, they were dropped from the study.

In the H-Phase (3 weeks, 3 sessions per week), participants performed 3 sets of their primary lifts using 5 to 8 reps/set and 4/5 sets of their secondary lifts using 8-10 repetitions/set with moderate to heavy resistance (i.e., amount of weight lifted). In the S-Phase (3 weeks, 3 sessions per week), they performed the same primary lifts as in the H-Phase but with a different group of secondary lifts. Once again, they performed 3 sets of their primary lifts using 3 to 6 repetitions/set and 4/5 sets of the secondary lifts using 8-10 repetitions/set with heavy resistance. In the P-Phase (3 weeks, 3 sessions per week), they once again performed the same primary lifts and another group of secondary lifts that were performed with more explosive power focusing on the speed of the lift. They performed 7 sets of their primary lifts using 2 to 5 repetitions/set and 1 to 3 sets of the secondary lifts using 6 to 10 repetitions/set with light to moderate resistance. The number of repetitions and sets varied depending on the type of exercises performed (Table 1 and 2). While lifting was taking place, feedback on proper execution form, spotting techniques, verbal motor cues, and movement modifications were frequently given to all participants throughout the duration of the training sessions. All post tests were conducted in the same fashion as the pre tests.

#### **Data Analysis.**

For both pre and post test PRTG and CG, means and standard deviations were calculated for absolute strength, relative strength, body weight, and the fastest score for each of the six speed performance tests. Pearson correlation coefficients were calculated between relative strength and each of the speed performance results for the pre and post-test scores. A series of one-way ANOVAs were used to determine changes in strength and speed from the pre to post test and differences between the control and PRTG groups. Significance was set at  $p < .05$ .

## Results

Participants in both the PRTG and CG were between 15 and 17 years of age. There were nine PRTG participants, comprised of eight football players and one soccer player, with an average body mass of  $76.65 \text{ kg} \pm 10.43 \text{ kg}$ . There were nine CG participants, comprised of six soccer players and three football players, with an average body mass of  $68.04 \text{ kg} \pm 4.08 \text{ kg}$ .

There was a significant difference for absolute strength ( $F(1,32) = 52.02, p < .001$ ). The PRTG mean ( $1,329.68 \text{ N} \pm 260.65 \text{ N}$ ) was greater than the CG mean ( $872.32 \text{ N} \pm 154.7 \text{ N}$ ). There was also

Relative strength was most highly correlated ( $-.72$ ) with the Nebraska Agility Drill for the PRTG pre-test.

## Discussion

The purpose of this study was to investigate whether a short-term periodized resistance-training program would improve relative strength and change-of-direction speed in male high school athletes. The results from the pre and post tests show that both groups showed some improvement in their speed. It was determined that the PRTG may have improved because the resistance-training protocol

Table 3

*Comparison of PRTG and CG Pre and Post Test Means*

	Absolute Strength (Newtons)		Relative Strength (Newtons/Body weight {N})		Nebraska Agility Drill (sec)		T Drill (sec)		20 m dash (sec)	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
<b>Test Group</b>	1,217.21 $\pm$ 261.54	1,406.54 $\pm$ 250.02	1.69 $\pm$ 0.33	1.87 $\pm$ 0.27	8.56 $\pm$ 0.40	7.96 $\pm$ 0.30	9.49 $\pm$ 0.30	9.21 $\pm$ 0.23	3.38 $\pm$ 0.10	3.30 $\pm$ 0.16
<b>Control Group</b>	770.48 $\pm$ 149.94	884.173 $\pm$ 145.23	1.16 $\pm$ 0.24	1.33 $\pm$ 0.22	8.61 $\pm$ 0.68	8.51 $\pm$ 0.61	9.24 $\pm$ 0.36	9.22 $\pm$ 0.72	3.29 $\pm$ 0.15	3.37 $\pm$ 0.19

a significant difference for relative strength {i.e., weight lifted {N}/body weight {N}} ( $F(1,32) = 34.9, p < .001$ ). The PRTG mean ( $1.78 \pm 0.31$ ) was greater than the CG mean ( $1.24 \pm 0.24$ ). The training effect approached significance ( $p = .055$ ) for the Nebraska Agility Drill, with the PRTG mean ( $8.26 \text{ sec} \pm 0.46 \text{ sec}$ ) faster than the CG mean ( $8.56 \text{ sec} \pm 0.63 \text{ sec}$ ). Both the PRTG and CG increased absolute, and thus relative, strength with the training activities.

was designed more to develop lower body strength where the CG may have improved because, even though they were training on their own, they were participating in sport-specific training involving speed and agility drills during the period of the study. However, there was a significant difference for both absolute and relative strength, with the PRTG mean greater than the CG mean. The training effect also approached significance for the Nebraska Agility Drill with the



PRTG mean faster than the CG mean.

Even though football and soccer players are similar in that they both rely on change-of-direction movements on the playing field, football players vary from soccer players in physiological traits and athletic skill sets. Where football players utilize more combined speed-strength actions, soccer players utilize more combined speed-agility actions. While the short-term training protocol did not significantly improve the PRTG change-of-direction speed as expected, it did increase their absolute and relative strength over the course of the training program, which resulted in a high correlation between relative strength and COD speed on the Nebraska Agility Drill. In relation to the research question, the periodized resistance-training program may not have resulted in significant COD changes; however, it did have a positive effect on strength.

There are several studies in the literature that are consistent with this study's findings. Regarding the effectiveness of short-term training programs on speed and strength, an 8-week study by Tricoli et al. (2005) and a 15-week study by Hoffman and Kang (2003) both showed no significant improvements in performance on COD speed. In research related to the effectiveness of periodized resistance training on motor performance, Jones et al. (2009) conducted a 9-month PRT program that also found little to no improvements on COD speed. However, in terms of the correlation between relative strength and COD speed, the findings from this research are supported by a study by Keiner et al. (2013), who found a significant correlation between relative maximum strength and sprint speed of 132 elite youth soccer players. Likewise, studies by Hori, et al. (2008) and Requena, et al. (2009) showed a clear influence of strength training on acceleration and sprint speed of 29 semi-professional rugby players.

For the duration of the study, the PRTG trained three days a week performing exercises specific to improving hypertrophy, strength, and power. The CG trained the same number of days a week, but their training consisted of performing and practicing soccer-related skills for developing agility and sprinting speed. Considering the length of the training protocol, the three-day-per-

week work-out schedule was not enough time to have a training effect to show significant improvement compared to the CG. In addition, the training protocol was not specific enough in relation to the three speed tests chosen. While the training protocol was specific to developing speed and strength skills used on the playing field, it may not have been specific to developing the speed and strength skills used for the pre and post tests.

These findings could also suggest that the pre and post tests chosen for this particular study did not provide enough precision or were not the best measure of COD speed for the PRTG because of the nature of the participants' sports, their physiological abilities, or their athletic skill sets. The distance covered and the time it took to complete each COD speed drill may not have been long enough to show much improvement. In addition, COD drills incorporate agility as one of the main skills needed for proper execution. Unlike strength and endurance, which are fitness components that can be developed with training, agility is a skill that is difficult to learn.

Another factor that affected the outcome of the study resulted from the selection of participants into PRTG and CG based on time commitment to create the best scenario for compliance. The PRTG was predominantly football players, where the CG was predominantly soccer players. While the PRTG of football players was training three times per week in a weight room under supervision of the researcher, the CG of soccer players was training three times per week in self-organized practices that included speed and endurance drills. Discussions with CG members indicated no evidence of their participation in any type of resistance training.

Limitations. There were several limitations that could have affected the outcome of this study. Factors such as parental consent and medical clearance limited the pool of athletes who could be recruited. The recruitment pool had to be limited to only those students who were currently on a fall sport roster and medically released for participation. Since a good majority of the rostered athletes were graduating seniors, that further limited the pool. In addition, since the remaining rostered athletes were under the age of 18, they needed parental consent to participate.

Attendance was another limitation of this study because of issues such as commitment of participants and transportation. Commitment issues could have resulted from lack of interest, absence of incentives, or conflicting priorities such as work, driver's education, or family responsibilities. With respect to transportation issues, it was difficult for athletes to attend all three sessions per week, especially if they did not have a driver's license. Since five weeks of the study took place during the summer months, there was no bus transportation to and from the school. If a participant missed a session, they were required to make up that session on their own time. Average attendance for the PRTG was 2.9 sessions per week. After discussions with the CG it was determined that their average attendance was 2.7 sessions per week.

## Conclusion

The periodized resistance-training protocol increased strength, but so did the pre-season activities of the CG. The correlation between speed and relative strength was not improved with training. This short-term, three-day program was not enough to result in significance differences in change-of-direction speed. For future research several changes should be considered. One important consideration should be in regard to the recruitment pool; the participants should be chosen from the same sport. In addition, the training protocol should better match the skills and movements used specifically in the sport played by the athlete. In order to increase the number of participants in the study, more flexibility should be considered for the days per week and the hours of availability. While keeping the short-term time frame of the study, one should consider scheduling more sessions than three times per week.

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## About the Author



Brooke Pacheco is a graduating senior at Bridgewater State University with a major in Physical Education and a minor in Studio Art. Her research was conducted in the summer of 2015 under the mentorship of Dr. Pamela Russell (Movement Arts, Health Promotion, and Leisure Studies) through funding provided by an Adrian Tinsley Program summer research grant. Brooke presented this work at the 2016 National Conference on Undergraduate Research at the University of North Carolina – Asheville. She will also present it at the American College of Sports Medicine Annual Meeting and World Congress in Boston this summer. Brooke's future goal is to attend graduate school in the area of Exercise Physiology and Kinesiology. She hopes to teach Physical Education at the high school level and would also like to secure a coaching or training position working with college athletes.

# The Mystery of the Non-Transitive Grime Dice

NICHOLAS PASCIUTO

In this paper we begin by studying a set of non-transitive dice, known as the Grime Dice, which function similar to the game of Rock-Paper-Scissors (RPS). Perhaps you remember this game as a way of deciding things at some point in time like who goes first or who gets the last cookie. Rock-Paper-Scissors is an example of a non-transitive game, which means that although Rock breaks Scissors and Scissors cuts Paper, unexpectedly Paper wraps Rock (some people say Paper “covers” Rock) creating a cycle of victory where no player has an advantage. The Grime dice function similar to this game with some differences. We observe various properties of these dice such as dual non-transitive chains and a counterintuitive, reversing property when moving from one die to two dice. We determine that this reversing property does not continue as the number of dice increases and provide some evidence that suggests an infinitely reversing characteristic may not be impossible. We examine other sets of non-transitive dice and constructed non-transitive sets of dice, including some new sets of our own creation, for all of the Platonic solids.

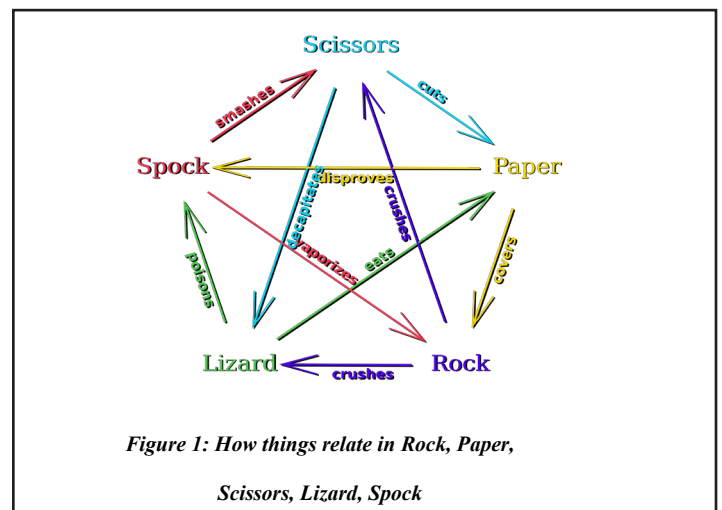
A relation on a set of objects is said to be transitive if, for every three objects,  $x, y, z$ , in the set, when  $x$  is related to  $y$  and  $y$  is related to  $z$  then  $x$  is related to  $z$ . For example, the relation, “greater than” (symbolized by  $>$ ) is a transitive relation on the set of real numbers because for every three real numbers,  $a, b, c$ , if  $a > b$  and  $b > c$  then  $a > c$ . The term “transitive” means carries across. In the case of the relation “greater than” ( $>$ ), the property of one object being greater than another carries across all the objects in the set from  $a$  to  $b$  to  $c$ , giving  $a > c$ .

A relation on a set of objects is non-transitive if, for every three objects,  $x, y, z$ , in the set, when  $x$  is related to  $y$  and  $y$  is related to  $z$ , then  $z$  is related to  $x$ . “Non-transitive” refers to the fact that the relation does not carry across from the first to the last object but in fact creates a cycle.

Both properties can be found in many real world situations. For example, a lynx preys on a fox, a fox preys on a squirrel, however, the lynx also preys on squirrels completing a transitive relation among these animals. A non-transitive chain occurring in nature is the California side-blotched male lizards whose different variations compete for female lizards with each male variation having an advantage against another in a non-transitive chain of three.

A familiar example of a non-transitive situation is the game of Rock, Paper, Scissors (RPS). In this game Rock beats Scissors, Scissors beat Paper, and Paper beats Rock. This non-transitive cycle is called a chain. Thus RPS contains the chain: Rock beats Scissors, Scissors beats Paper, and Paper beats Rock. Of course, each chain could start at any object because they are cycles.

Note the appearance of two distinct chains each of which includes all the objects in the set. The outside chain exists in the form of a circle while the inside chain exists in the form of a five pointed star. The outside chain: starting at Paper, which covers Rock, continues through Rock crushes Lizard, Lizard poisons Spock, Spock smashes Scissors, and completes the chain with Scissors cut Paper. The inside chain: starting with Scissors which decapitates Lizard,



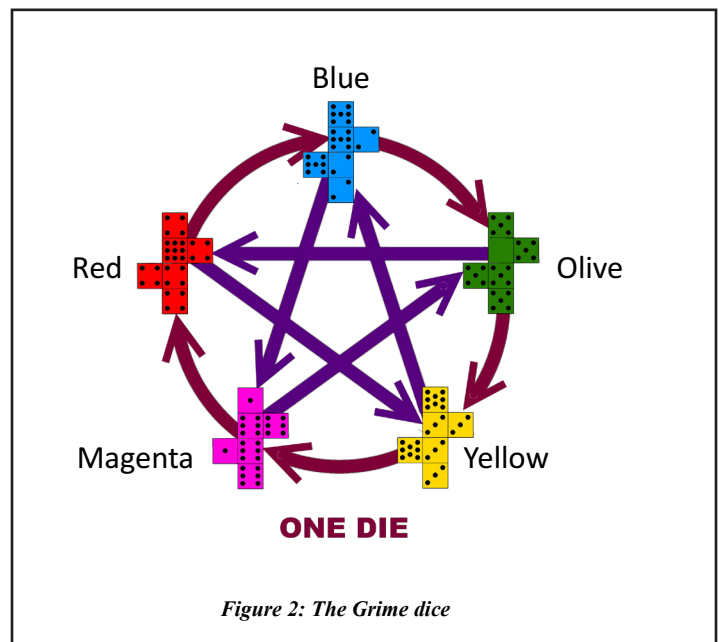
Lizard eats Paper, Paper disproves Spock, Spock vaporizes Rock, and concludes the chain with Rock crushes Scissors.

The game of RPS is played with two players throwing, at the same time, one of the hand signals for either Rock (a closed fist), Paper (an open, flat hand) or Scissors (two fingers separated in the shape of a pair of scissors). If two players, player A and player B, randomly choose which sign to throw then they will tie (throw the same sign) one third ( $3/9$ ) of the time, player A will win one third of the time ( $3/9$ ) and player B will win one third ( $3/9$ ) of the time. Thus when there is a winner the probability of a player winning is 50%. When there are five objects (RPSLS) in the set, the two-player game is similar in terms of winning percentages because each object defeats exactly two others and loses to exactly two others. If two players, player A and player B, randomly chose which sign to throw then they will tie (throw the same sign) one fifth ( $5/25$ ) of the time, player A will win two fifths of the time ( $10/25$ ) and player B will win two fifths ( $10/25$ ) of the time. If there are three players, although the probability of winning given the objects are chosen at random is still even, the game becomes more complex with more options and outcomes. In this version it is not only possible that all three players throw the same sign, but also there could be either transitive triples (Rock, Scissors, Lizard) or non-transitive chains (Spock, Scissors, Lizard). A non-transitive chain like Spock, Scissors, Lizard may be interpreted as a different kind of a tie, while a transitive triple chain like Rock, Scissors, Lizard would be a win for the player throwing Rock.

Dr. James Grime invented Grime dice, which are built on the traditional cubic dice. They are six sided (hexagonal or cubic) dice each of whose sides (or faces) contain any number of dots from 0 to 9. There are five dice colored Red, Blue, Olive, Yellow and Magenta. Figure 2 gives a representation of the dice. <http://singingbanana.com/dice/article.htm>

In Figure 2 each die is unfolded so that all six faces are visible in the plane. They are also arranged so that two distinct chains of who beats whom can be identified. The dice are cleverly designed so that the two non-transitive chains can be easily identified by the

names of the colors of the dice. The number of letters in each color organizes the first chain, which will be referred to as the outer chain throughout this paper. So this chain is Red (3 letters), Blue (4 letters), Olive (5 letters), Yellow (6 letters), and Magenta (7 letters). Note that Magenta wraps around to beat Red. The next chain, referred to as the inner chain throughout this paper, is organized alphabetically



by the first letter of each color. Thus, starting with the earliest letter (alphabetically) of a color of the dice, B, the chain goes Blue, Magenta, Olive, Red, Yellow, and note that Yellow wraps around to beat Blue. Grime dice are similar to the set Rock, Paper, Scissors, Lizard, Spock in that both contain five objects and both share two non-transitive chains. Arrows in Figure 2 indicate these chains.

Some differences between RPSLS and Grime dice are (a) how the game is played, and (b) most importantly, the fact that winning in Grime dice is probabilistic. (a) Grime dice require choosing and rolling dice instead of throwing hand gestures. Each one of the five dice has two different numbers on the six faces. For example, the Red die has five sides with four dots (a roll of 4) and one side with nine dots (a roll of 9). The game is traditionally played by having one person, the challenger, seek out a person to play, the opponent. Then

the opponent picks one die from the set of five colored dice. Once that is done the challenger picks from the remaining four dice. The notion behind this is that the challenger may be able to pick a die that appears to be more likely on average to beat the other die. Players then simultaneously roll the dice and compare the size of the rolls. The numbers of dots (the size of the roll) is used to decide which die wins that roll. The die with the higher number will win that roll. A game may consist of the best of three rolls or the best five rolls or the best of some number of rolls. The winner is the player who wins a majority of the rolls that are not ties. (b) In RPSLS, Rock always breaks Scissors. This never changes. However in Grime dice sometimes the Red die beats the Blue die and sometimes the Blue die beats the Red die. This probabilistic aspect creates some interesting

property holds in a chain) means that the winning order of that chain will reverse when doubles are used instead of single dice. In this case the outside chain has the reversing property, so the new order (when pairs of dice are rolled instead of single dice) becomes Magenta, Yellow, Olive, Blue, Red, and Red wraps around to beat Magenta. If the challenger now picks first and chooses Blue, the opponent unaware of the reversing property for doubles would pick the color die that he or she assumes would beat Blue, namely Red. The opponent would be correct if it weren't for the fact they were playing doubles and thus the opponent has picked the losing die (because with doubled dice, counter-intuitively, Blue beats Red more often).

In Figure 3 each row is labeled with a color, and the properties of the die with that color are listed in the other eight

Color	Average	Mode	1st #	Prob. 1st	Fraction	2nd #	Prob. 2nd	Fraction
Red	4.833	4	4	0.833	5/6	9	0.167	1/6
Blue	4.500	n/a	2	0.500	1/2	7	0.500	1/2
Olive	4.167	5	0	0.167	1/6	5	0.833	5/6
Yellow	4.667	3	3	0.667	2/3	8	0.333	1/3
Magenta	4.333	6	1	0.333	1/3	6	0.667	2/3

**Figure 3: The Grime Dice Characteristics**

features for the game.

In particular, these dice contain a unique property referred to as the order reversing property or reversing property. In a normal game the opponent picks one die out of the five and the challenger picks a different die (one of the remaining four; no duplicates are allowed). After several games, because the opponent in general loses more often, the opponent might become a little suspicious. Perhaps the opponent even figures out how the challenger keeps winning. Instead of not playing any more the opponent may try to turn the tables and have the challenger pick first. The challenger should agree and just to make it interesting suggest that they each choose two dice of the same color instead of just one. Amazingly enough, now the reversing property of the outside chain comes into play.

To say a chain has the reversing property (or, the reversing

columns. The column titled Average shows the average (mean value) roll for that die. For example, Olive had an average roll of 4.167, which was calculated by adding the results of each side (in this case 0, 5, 5, 5, 5, 5) and then dividing by the number of sides (6). The next column, Mode, tells us which result is most likely to occur. Since each of the numbers on the Blue die (2 and 7) is on three of the faces then there is no single mode because both two and seven occur the same number of times. The third column contains the smallest result on the die, which is followed in the next column by the probability of that number occurring and then by the probability represented as a fraction. The next three columns are the same for the other number on the die. This information is helpful because it allows us to evaluate who wins against whom.

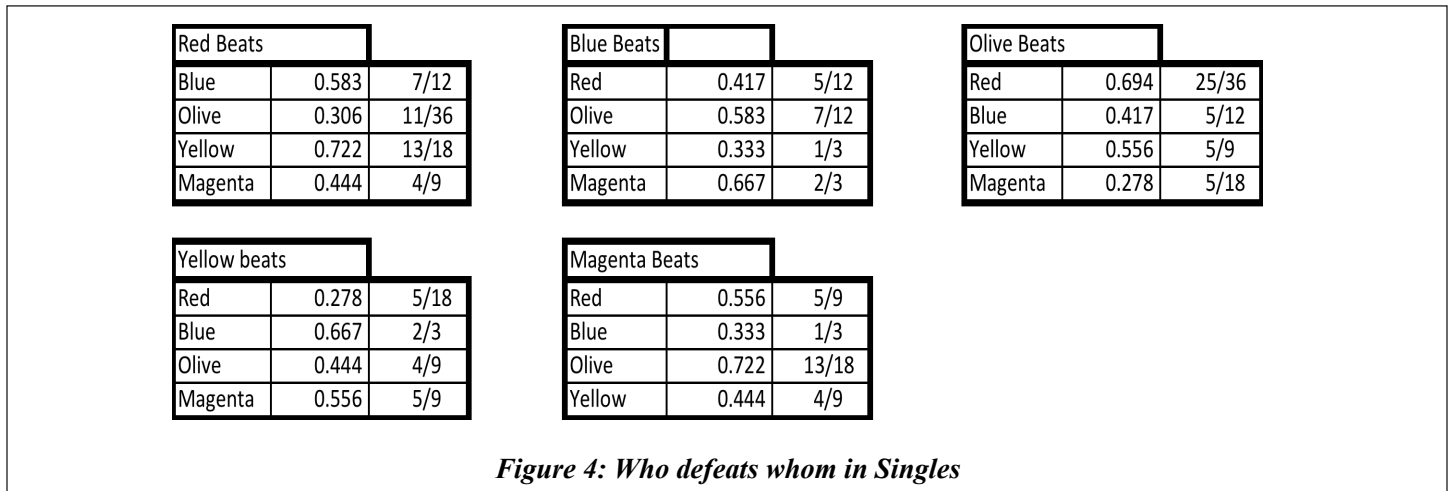
Figure 4 indicates the probability that a die would likely win

when faced against a different die.

There are five tables in this figure. Each table indicates how a particular die fares against each of the four other dice when rolled

based on the percentage from these tables.

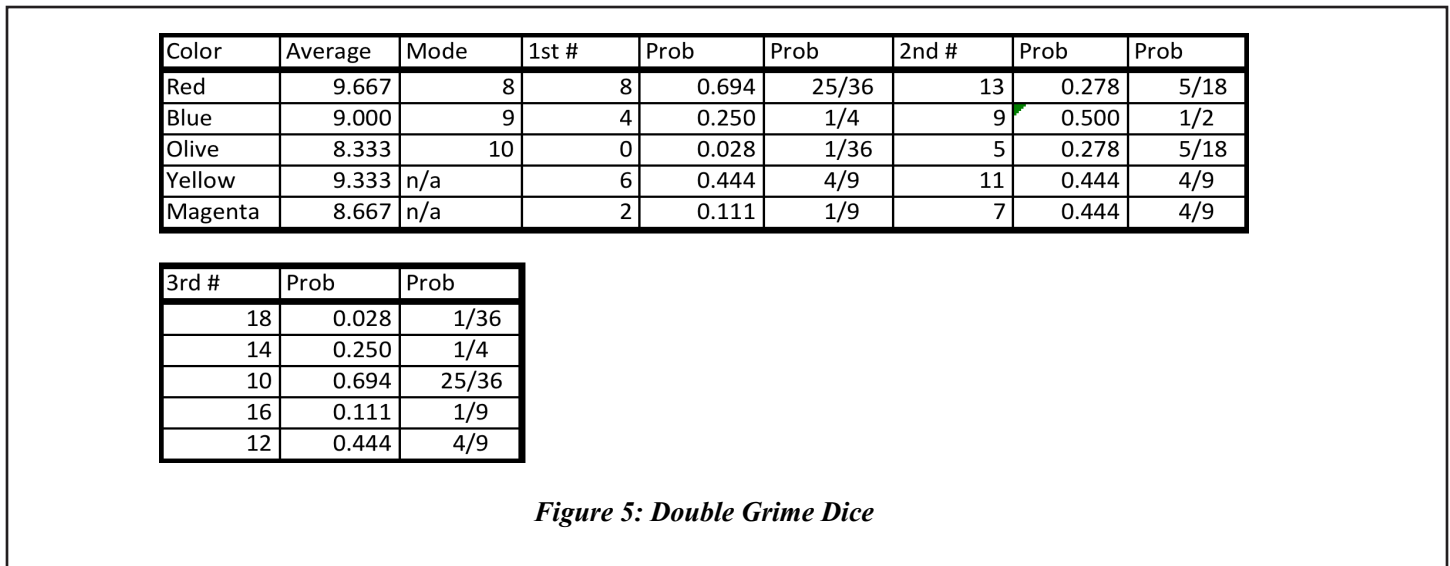
We now consider results from playing the game with pairs of dice of the same color.



once. The middle column of each table contains the probability in decimal form while the third column represents it as a fraction. Looking at the Red Table we see that Red beats both Blue and Yellow because the probability of rolling a higher number is greater than .50 (or 50%), but loses to both Magenta and Olive. Note that each die beats exactly two other dice and loses to exactly two other dice. Also observe that the highest winning percentage is 0.722 or (72.2%). These results are visually seen in Figure 2. The arrows are oriented

**Figure 5: Double Grime Dice**

Figure 5 reads the same as Figure 3. There is one specific change however, instead of only two numbers there are now three sums created by the sum of the numbers on the two dice. Using techniques of combinatorics we compute the number of ways of obtaining each of the sums, specifically using the formula for calculating the number of combinations of k things taken from a set



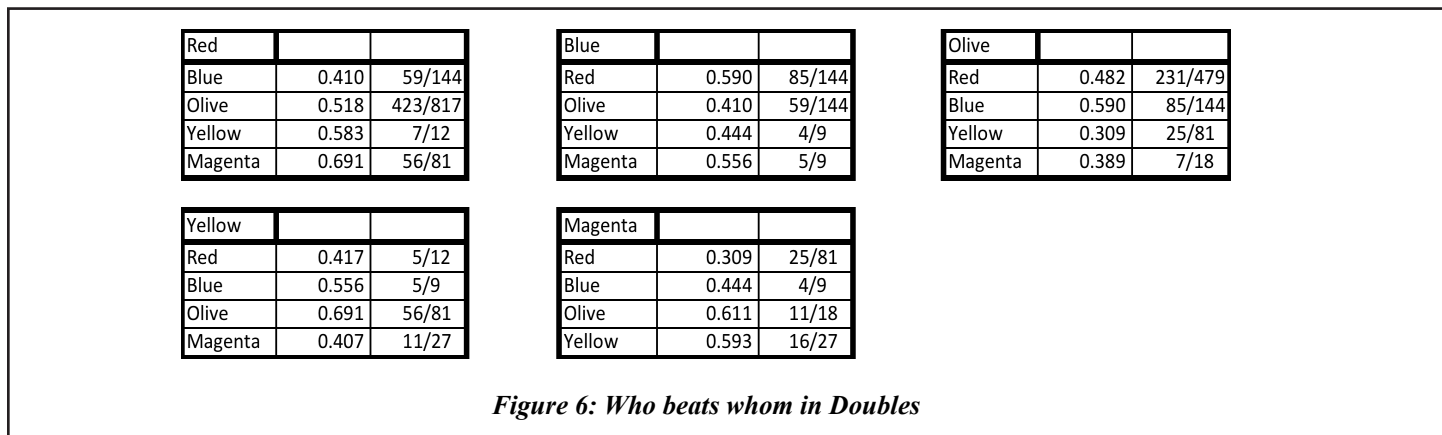
of n things, denoted by  $\binom{n}{k}$  and read as “n choose k”. Next, probability trees were constructed to complete the probabilities for pairs of dice.

Figure 6 indicates the reversing property when playing with pairs of dice of the same color.

**Figure 6: Who beats whom in Doubles**

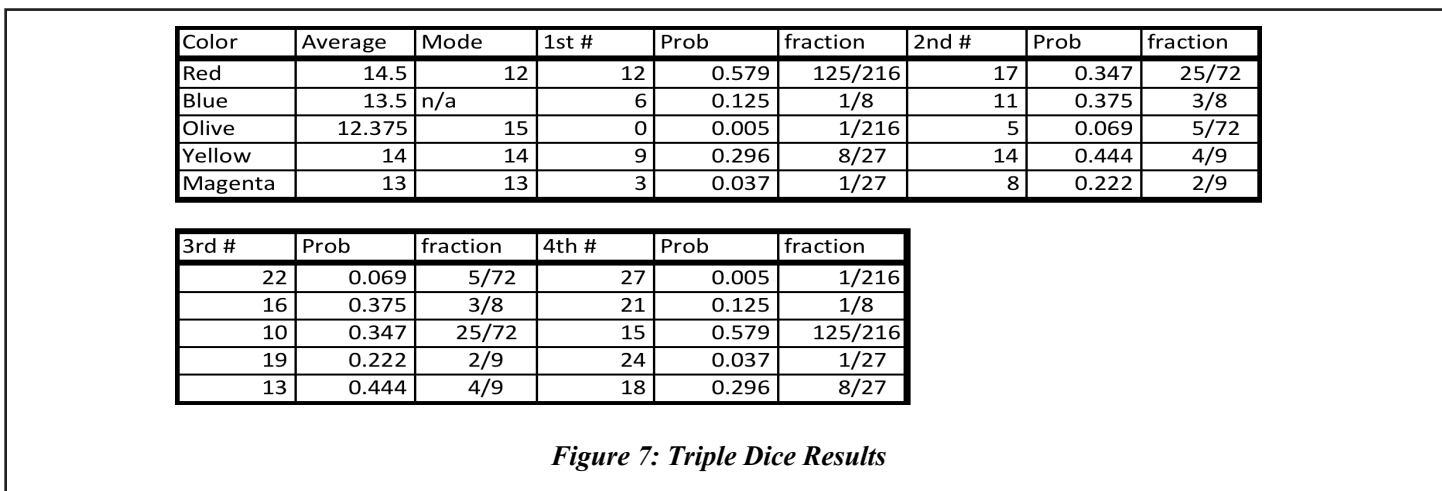
Figure 6 shows the results for a game with double dice.

and Magenta). Since there is still an outside chain, this indicates that the inside chain must break down. This was known about the dice; however, Grime argued that because Olive only loses to Red by a number (0.482 or 48.2%) which is very close to 50%, it can be considered as 50% and over a few rolls it will not significantly affect the outcome. So we may ignore its influence without great harm, assume there is an intact, inside chain, and in general the overall



Here, probability trees were constructed to complete the winning probabilities between pairs of dice. This is the same process albeit somewhat more complicated than what was used to determine the odds in Figure 4. Follow the original outside chain in reverse to see that the reversing property does indeed happen. However, drawing your attention to the Olive table we see a big problem. Olive no longer beats two other dice, but in fact loses to three (Red, Yellow,

probabilities will still work effectively for the challenger. Figure 7 presents the results when three of each type of die are rolled. This figure is similar to Figures 3 and 5 with the difference that rolling three of each type of die gives four different possible sums. The following Figure represents the likelihood of three dice all the same color winning against another different set of three dice



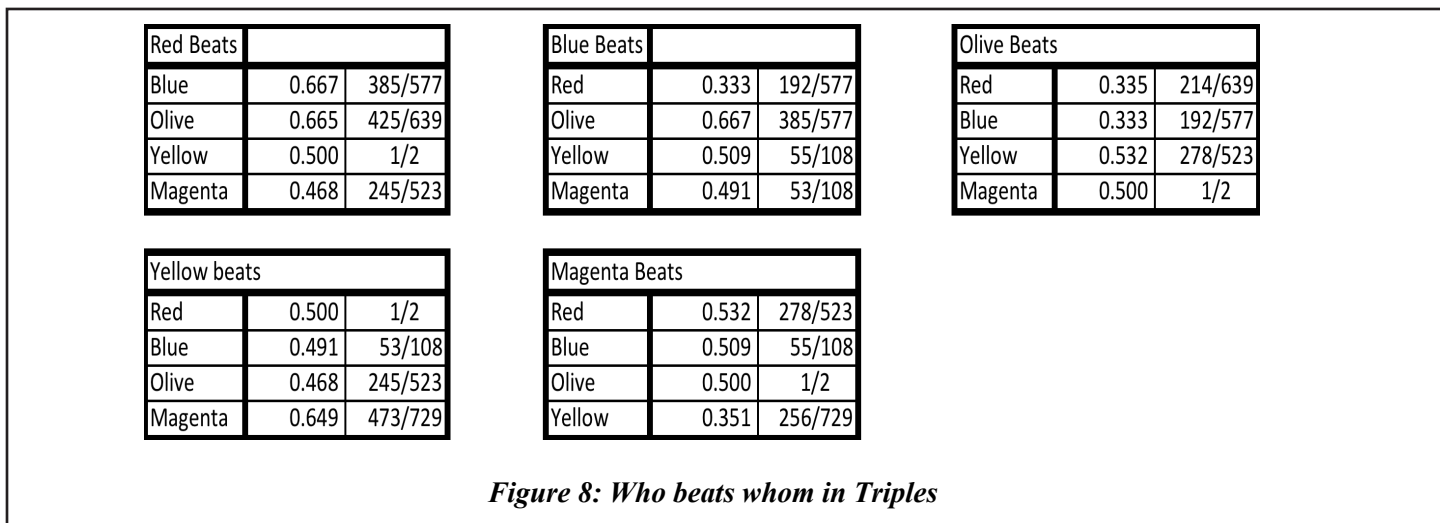


all the same color.

Looking in Figure we can find that the original outside chain is reestablished. Now, for rolls of three dice, as in the game

and the dodecahedral dice. Finally we will conclude with sets of icosahedral dice.

Currently the only set of non-transitive tetrahedral dice



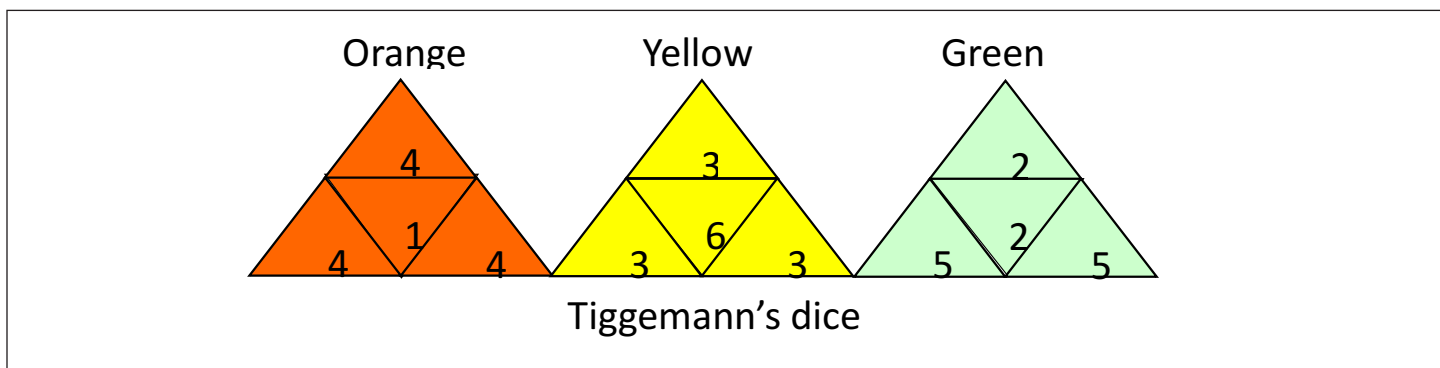
for where one die is rolled, we have again that Red beats Blue beats Olive beats Yellow beats Magenta beats Red. Thus the outside chain has actually reversed twice. However the inside chain is broken down even more than before.

In the rest of this paper we describe a Catalog of non-transitive dice for the five Platonic solids. Platonic solids are three-dimensional regular polygons, which means that every face of the solid is a regular polygon of the same size and shape. There is only one known set of non-transitive dice for the tetrahedral dice. After describing them we will move to discuss sets created for the hexahedral dice. Then explain which sets exist for octahedral dice

are ones designed by Daniel Tiggemann. He was curious to see if it was possible to create non-transitive dice for the tetrahedron. Here, Orange beats Yellow (9/16), Yellow beats Green (10/16) and Green beats Orange (10/16).

Tiggemann's dice do in fact reverse. When doubled, Orange loses to Yellow (121/202), Yellow loses to Green (132/256) and Green loses to Orange (132/256).

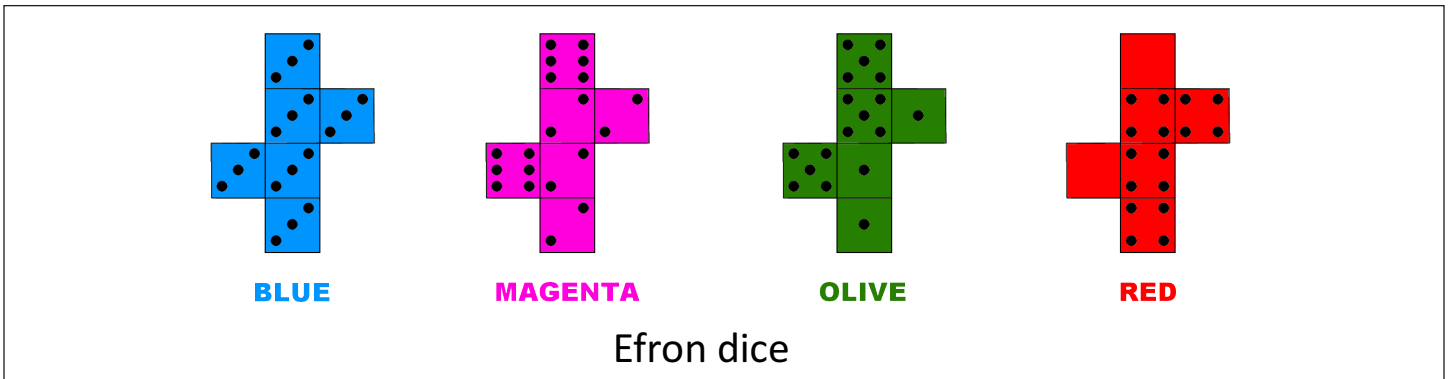
We used these dice to create sets for the octahedron (eight sides), the dodecahedron (twelve sides), and the icosahedron (twenty sides). It is possible to expand the tetrahedron to those solids because their number of sides are multiples of four. This means that since the



dice will retain the same probabilities, the dice will also have the same non-transitive cycles.

For the hexahedral dice there already exists the Grime dice, but there is also a set called the Efron dice. Brad Efron created the Efron dice, which uniquely have four objects in the set. Each die beats the next in the list by two thirds: Blue beats Magenta, Magenta beats Olive, Olive beats Red and Red beats Blue. This is different than all the other dice we have looked at because, in Efron dice, each die beats the other with the same probability. <http://singingbanana.com/dice/article.htm>

1,1,4,4,4,4,4,4 and 3,3,3,3,3,3,6,6 and 2,2,2,2,5,5,5,5. These have the same properties as the Tiggemann dice. The second set is a set of our own design. We began a search for a set of octahedral, non-transitive dice, which were not just an expansion of the tetrahedron. We worked on a set of three dice with three different numbers on each die and we continually modified the numbers until we obtained a non-transitive chain (Yellow->Orange->Green). Three numbers expanded the probabilities that we could use. We name this new set the Nichlman Dice by combining the first half of the author's first name with the last half of his mentor's last name. Oddly, the Yellow

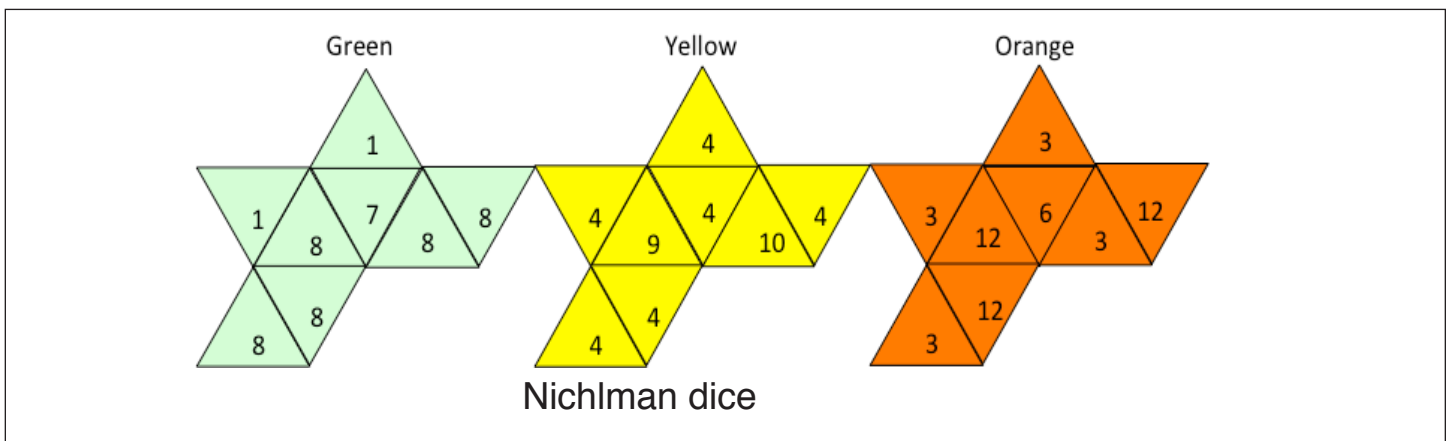


This set of dice was the first set of dice which we tested that did not reverse. They do not reverse because when doubled the Red die is too weak: it loses to both Blue and Olive. The Efron dice were used by Warren Buffet in a famous game with Bill Gates.

Currently there are two sets of octahedral dice. The first, as we previously stated, are the Tiggemann expanded to the octahedron;

die has the smallest average roll (5.25) yet it beats the die with the largest average roll, the Orange die (6.75).

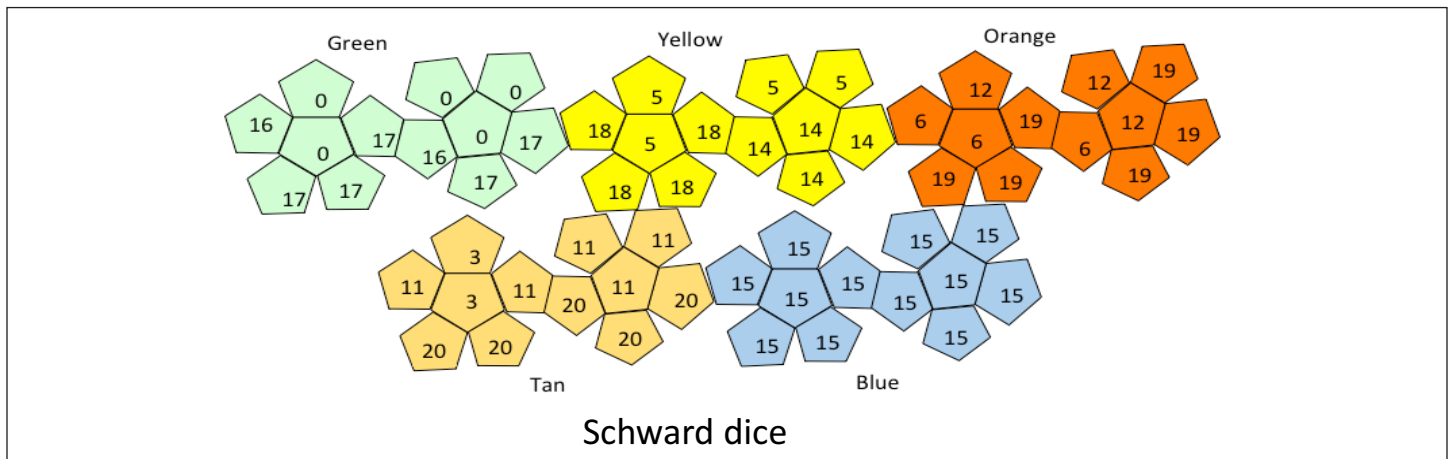
Although these dice form a non-transitive chain they do not in fact reverse because the Green die, which has the middle average (6.125), is too strong when doubled causing it to beat each of the other dice.



There are a total of three known sets for the dodecahedral dice. As previously stated we can create a set from expanding the Tiggemann dice. We created the second set of non-transitive dodecahedral dice and named them Schward by combining part of the author's last name and his mentor's first name. These dice only contain an outside chain and would need more work on the numbers and probabilities so that the dice will also have an inside chain.

expanding the Tiggemann dice. Another set of icosahedral dice is a set of dice that we created, which we named the Pascannell Dice. The name comes from the beginning part of the author's last name "Pas" combined with his girlfriend's last name "Scannell". These dice do not reverse.

Using the data collected from the Grime dice and trail and error we have been able to create new sets of non-transitive dice.

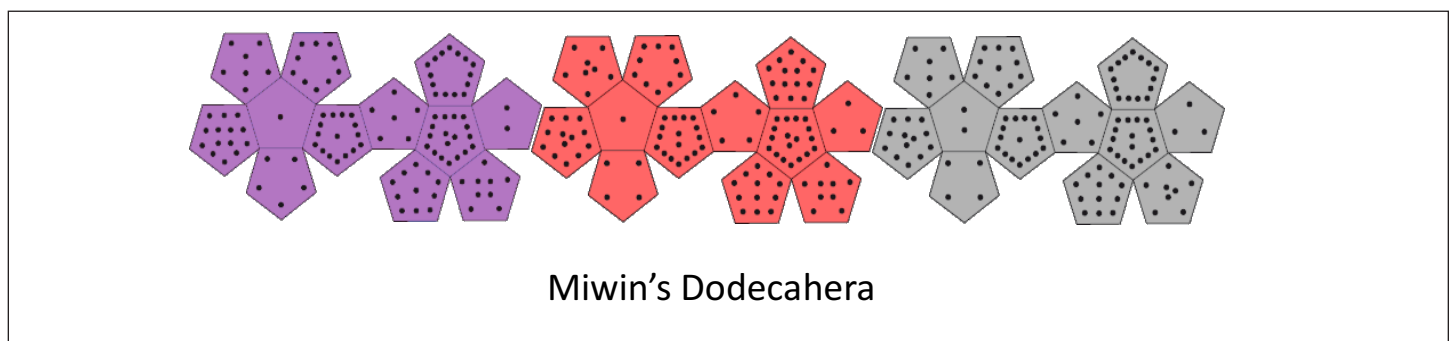


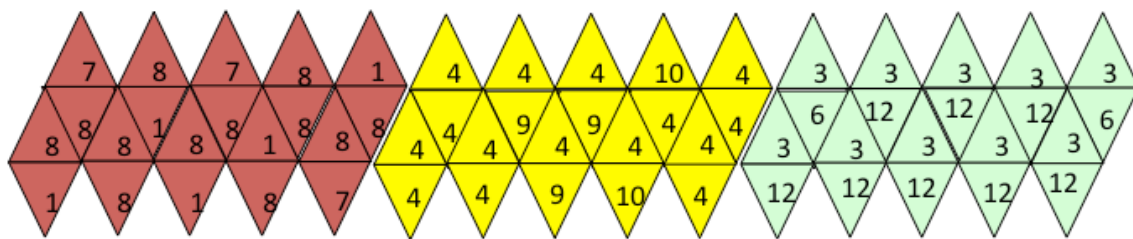
In addition to not having an inside chain the Schward dice do not reverse either.

Michael Winkleman invented a set of dice called Miwin's Dodecahedral dice, which also share a similar quality to the Efron dice. This property is that each die in the chain beats the next die with the same probability. [https://en.wikipedia.org/wiki/Nontransitive\\_dice#Nontransitive\\_dodecahedra](https://en.wikipedia.org/wiki/Nontransitive_dice#Nontransitive_dodecahedra)

The final platonic solid is the icosahedron. As previously stated we can create a set of non-transitive icosahedral dice by

This work shows that there are non-transitive dice not just for one Platonic solid but for all five of them. The study of non-transitive dice and patterns of non-transitive behavior has implications for many areas. A potentially important application of research of this type might be an investigation into whether non-transitive chains in nature or other fields might reverse as the number of animals or presence of materials increases beyond some point. For example, a food chain might reverse when the population's increase beyond some triggering point, or perhaps a subatomic process might invert





Pascannell die

its actions when quantities increase beyond a critical measure. In any case, this counterintuitive reversibility in non-transitive situations will continue to fascinate people far into the future. The following questions are conjectures and areas for further research:

1. Do the measures of central tendency (mean, mode, median) give any indication of the behavior of the dice as the limit of the number of dice approaches infinity?
2. Compute an absolute average (Absolute average =  $(\text{mean} + \text{mode} + \text{median})/3$ ) for each die and does the absolute average give any indication about what happens in general?
3. Is it possible to find a set of dice that reverses continually as the number of dice increases?
4. Is there a way to refine the definition of the reversing property so that we can make a general statement about non-transitive probabilities?
5. How long could a set of dice reverse as the number of dice increase?

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## About the Author



Nicholas Pasciuto is graduating in May 2016 with a major in Mathematics with a concentration in Pure Mathematics and a minor in Philosophy. His research project was completed in the summer of 2015 under the excellent mentorship of Dr. Ward Heilman (Mathematics). It was made possible with funding provided by an Adrian Tinsley Program summer research grant. Nicholas presented this paper at the 2015 Northeastern Section of the Mathematical Association of America and the 2016 National Conference on Undergraduate Research in Asheville, NC. He plans to pursue his Ph.D in Mathematics in the fall of 2016.

# Police Contacts and Attitudes Toward Police: A Study of Race and Policing

GARY PORTWAY

## Abstract

In the past couple of years, different police departments in the United States have ignited intense criticism for allegedly operating in unethical and unconstitutional ways, namely facilitating the law under racist principles. Since the structure of policing often shifts based on changes within general society, it has become a common standard that policing must match the highest degree of ethics adopted by citizens of the United States. There is a compelling need for more research to be done on the police-citizen relationship. This research studies whether there is disproportionality, with a specific focus on race and ethnicity, in some of the police contacts that Bridgewater State University students (selected via random sample) have had – a goal that helps illustrate whether unethical policing is systematic in our society.

## Introduction

Much of the scholarly and government-funded research on the relationship between police officers and citizens focuses on proactive policing strategies—oftentimes, strategies with a low or zero tolerance for crime—and whether those strategies encompass racist principles such as “racial profiling” (Department of Justice, 2015; Durose & Langton, 2013; Higgins, Gabbidon, & Vito, 2010). The Department of Justice (2015) deemed racial profiling to be an unconstitutional strategy of policing that can cause a loss of money, public embarrassment, and exposure to deleterious conditions. Therefore, many criminologists are concerned with how prevalent

racial profiling is in common policing strategies such as “street stops” and “traffic stops” (Department of Justice, 2015; Higgins et al., 2010; Ridgeway, 2006; Rojek, Rosenfeld, & Decker, 2012). A street stop refers to a police officer stopping a person who is not in a moving vehicle (e.g., who is walking down the street), and a traffic stop refers to stopping a person who is driving a motor vehicle.

The prevalence of racism in common policing strategies is supported by some research studies and countered by others, as many different studies have attempted to answer different questions regarding the issue (Department of Justice, 2015; Higgins et al., 2010; New York Police Department, 2014; Ridgeway, 2006; Rojek, Rosenfeld, & Decker, 2012). A report on New York City’s “stop, question, and frisk” program (Ridgeway, 2009) and the Department of Justice (2015) report on policing in Ferguson, Missouri found general police misconduct to be rare, but, where it does exist, located mainly in specific departments in the form of extreme misconduct (e.g., exacting racial profiling). Meanwhile, other research has indicated that racial profiling is not binary (i.e., either existing or not) but dependent on a variety of different factors and citizen perceptions (Durose & Langton, 2013; Higgins et al., 2010; Milner, George, & Allison, 2016; Ridgeway, 2006; Rojek et al., 2012; Tillyer & Engel, 2013). Durose & Langton (2013) found in a nationwide sample that, according to citizens who engaged with police in 2011, police misconduct could be systematic (as opposed to existing in a few departments). Higgins et al. (2010) found that police misconduct, including racial profiling, depends on dynamics in pre-existing relationships among officers and citizens of different races.

## Extreme Police Misconduct

The U.S. Department of Justice (2015) report on policing in Ferguson, Missouri stated that the growing disconnect in recent years between particular groups of citizens and police can be attributed to race-driven actions by some police officers. According to Higgins et al. (2010) such misconduct is detrimental to collective police-citizen relations as poor race relations increase the perception of racial profiling. According to Kerner et al. (1968), negative

behavior by police catalyzes negative reactions; bad race relations can be exacerbated unless specifically mitigated (Higgins et al., 2010). Therefore, understanding the most prominent examples of police misconduct is an essential component of understanding police-citizen relationships more broadly.

The RAND Corporation's report on the New York Police Department (NYPD) after it faced accusations of proactive policing practices (especially "stop, question, and frisk") as unconstitutional, undue, and race-driven, found that a small number of officers within the NYPD were committing unconstitutional acts that could be deemed racist (Ridgeway, 2009). In 2013, however, a federal judge ruled that the NYPD's proactive policing actions—especially the "stop-and-frisk" policy, which emphasized high quantities of street and traffic stops—were unconstitutional and had resulted from years of "systematic ignorance" (Floyd, et al., 2013), as opposed to being limited to a few officers. According to 2013 stop-and-frisk data of the NYPD, about 104,000 of the 191,812 total number of people stopped by police were Black (people who identify as "African American" or "Black and not Hispanic") (New York Police Department, 2014). For ethical reasons, the fact that 54% of those stopped were Black is of great concern; Black people make up approximately 26% of the city's population. The concern is further warranted by reports that proactive tactics such as stop-and-frisk do not decrease the crime they intend to deter (Bump, 2014). Ridgeway (2006) found that such practices often do not end in arrests, calling into question the worth of such practices.

Researchers have found practices similar to New York's stop-and-frisk in other police departments (Milner et al., 2016; Rojek et al., 2012; Tillyer & Engel, 2013). National attention was particularly focused on the police department in Ferguson, Missouri (FPD) when a Department of Justice (2015) report found it to be operating on racist principles. The federal probe into the Ferguson police department and court system discovered that African Americans, who make up approximately 67% of the population of Ferguson, comprised 85% of the street and traffic stops by the FPD, 90% of FPD citations, and 93% of arrests, between 2012 and 2014

(Department of Justice, 2015). The investigation concluded that law enforcement practices in Ferguson were shaped by a focus on revenue and not by safety needs of the public (Department of Justice, 2015). Although racial profiling in New York City and Ferguson have been called isolated events, researchers have found that people of color in many parts of the country perceive some of their interactions with police as "racially-driven" (Higgins et al., 2010; Zhao, Lai, Ren, & Lawton, 2015).

Every three years, the Bureau of Justice Statistics (BJS) conducts the Police-Public Contact Survey (PPCS), a supplement to the National Crime Victimization Survey that seeks to gauge how and why people ages 16 and older engage with police (Durose & Langton, 2013). While it is important to keep in mind high-profile instances reported in the Floyd ruling about the NYPD and the Department of Justice's (2015) findings about the FPD when looking at police-citizen contacts, the PPCS provides a much broader picture because it is comprised of tens of millions of experiences—an estimated 62.9 million in 2011 (Durose & Langton, 2013). Nearly half (49%) of those interactions came in the form of street stops or traffic stops. Those who identified as Black or Hispanic were subject to more street stops (percentage-wise) than White people (Durose & Langton, 2013).

The PPCS reports quantitative data that can inform discussions about systematic racism, but it does not delve into the complexities of the data, nor the possible causes or implications of the numbers. Academic researchers, however, have examined various intricacies involved in undue, racist policing—from citizens' previous interactions with police to the intersections of a person's race, gender, age, and even size. Ridgeway (2006) found that Black drivers stopped via traffic stops were subject to similar citation and consent rates as White drivers, but were pat-searched more often than White drivers. Each of those interactions with police may affect the next interaction. Warner (2010) found that perceptions of police were informed by police experiences outside of an incumbent one, such as citizens' previous experiences with state police. Black, young men have been found to have the most contact with police;

while a person's race alone did not correlate with undue policing, race in conjunction with a certain age and gender, did (Tillyer & Engel, 2013). Rojek et al. (2012) found that unequal policing can be caused by citizens who "appear to look out of place" in certain "neighborhoods." Zhao et al. (2015) attributed undue policing to both the race and size (in particular, "large" size) of certain citizens. The various causes of undue policing are troubling especially because negativity has been shown to beget negativity, further exacerbating police-citizen interactions (Higgins, et al., 1968; Kerner, et al., 1968).

Pollock (2014) called for more research on the subject of police-citizen interactions, saying that it is essential to the wellbeing of society that even "minor" police misconduct is gauged and resolved. Rectifying police misconduct "requires consistent and timely research" in communities across the country; adding original, primary data to the police-citizen dynamic can help illustrate the contemporary state of relationships between police and citizens (Pollock, 2014). This study is a response to that call. It investigated whether undue policing has been experienced by a random sample of students at Bridgewater State University, whether there are differences between students of different races and ethnicities, and how interactions with police may have affected students' attitudes toward police. This campus-based research is intended to promote understanding of broader trends reported in the literature.

## Hypotheses

This study began with four hypotheses that emerged from the literature on police-citizen interactions. The first hypothesis of this research is that the number of street stops for non-Whites is greater than the number of street stops for Whites. Although several researchers have found that police behavior does not necessarily correlate directly with race, due to intersectionality (which refers to co-existing attributes—such as a person's age, race, and gender—that are always present in conjunction with each other), street stops have been shown to differ by race in conjunction with other traits (Ridgeway, 2006; Tillyer & Engel, 2013; Zhao et al., 2015). Logically, this same notion can be applied to traffic stops, and therefore, the

second hypothesis of this research is that the number of traffic stops for non-Whites is greater than the number of traffic stops for Whites. The first and second hypothesis in conjunction with the work of Kerner et al. (1968) and Higgins et al. (2010) led to the third hypothesis of this research: non-White students have a less favorable attitude toward police than White students. Finally, the fourth hypothesis of this research can be derived from the third (specifically due to Kerner et al.'s work in 1968): contact with police (in the form of street stops or traffic stops) negatively affects attitudes toward police.

## Methods

### *Overview*

This study gives a snapshot of the state of police-citizen dynamics, as reported from the perspectives of 250 college students enrolled at Bridgewater State University. The research sought to discover how a particular college-age population has interacted with police in the past, and how the population feels about the police. Through a quantitative design this study addresses two main research questions: Did police contact with the students differ by race and ethnicity? Did police contact impact the students' attitudes toward police?

Data were collected via respondent questionnaires. Out of 2,103 classes offered by Bridgewater State University in one semester, 50 were randomly selected to participate in this study by means of a random-number generator application. Over the course of six weeks, 250 students, in 13 classes, consented to participate in the research and were administered the questionnaire.

### *Instrument*

The instrument used in this research was replicated and based on the Bureau of Justice Statistics' most recent Police-Public Contact Survey (PPCS). The PPCS is a supplement to the National Crime Victimization Survey that seeks to gauge how and why people ages 16 and older engage with police (Durose & Langton, 2013). Like the PPCS, the questionnaire used for this research has

several different categories: general questions (e.g., respondent's age), general police-related questions (e.g., the number of times the respective respondents had contact with police), specific questions related to the respondents' most recent contact with police (street stops, traffic stops, or voluntary contacts), and a section dedicated to the respondents' perceptions of police (e.g., gauging how honest the respondents think police generally are).

### *Demographics*

Three of the most pertinent characteristics of the 247 student responses (3 of the 250 questionnaires were left blank, leaving an "N" of 247) are age, race, and gender. 246 respondents answered the questionnaire with their age (in years). The lowest age was 17 and the highest age was 59 (range = 42). The mean (M) of ages (in years) is 21.1585 with a standard deviation (SD) of 4.16341. All 247 identified for their race(s). "White" was the most commonly identified race (198 respondents) and "Middle Eastern, Arabic" and "Native American, Alaskan, Pacific Islander" were the least common, with two respondents each. Among the other respondents, four identified as "Asian"; 24 identified as "Black or African American"; 14 identified as "Hispanic, Latino." For gender, 135 identified as "Male," 111 as "Female, and 1 as "Other."

In the general Bridgewater State University population in 2013, there were 9,615 undergraduate students (Bridgewater State University, 2014). Forty-two percent of those undergraduate students identified as male and 58% identified as female. About 82% of students identified as "White" and 18% identified with a race other than "White." Among the non-White students, 801 identified as "Black," 558 identified as "Hispanic," 265 identified as having "Two or More Races," 221 identified as "Asian," 22 identified as "Native American," and 10 identified as "Native Hawaiian" (Bridgewater State University, 2014).

## **Results**

**H1: The number of street stops for non-Whites is greater than the number of street stops for Whites.**

In H1, the dependent variable was street stops and the independent variable was race. Street stops were measured by "yes" or "no" responses and race was recoded into two categories: "White" and "non-White." Dividing the assortment of races into two categories was a succinct way of measuring contact with police; furthermore, both the PPCS and the Bridgewater State University Fact Book have stratified races into such categories (Bridgewater State University, 2014; Durose & Langton, 2013). Out of 247 respondents, 30 (12%) said that they had a street stops within 12 months of taking the questionnaire. In order to test the association of street stops and race/ethnicity (to test whether the observed distribution was due chance), a Chi Square analysis was used. The test found no significant connection between the variables because the p-value produced was greater than .05 alpha ( $p > 0.05$  alpha). In other words, according to the respondents' questionnaires in sum, no particular race/ethnicity was correlated with a street stop. However, this observation is limited based on the "superficial" questions within the questionnaire: this analysis is not able to penetrate into why the respondents were stopped. Furthermore, the analysis used can only gauge the observed distribution as a whole and not into several different categories that were not measured. More in-depth research methodologies that fall on the qualitative spectrum could better illuminate individual experiences and in-depth attributes of respondents (and thus, more conspicuous correlations). However, due to time constraints for this research, such methods were not used, as they can be costly and time-consuming.

The results show that 19.2% of non-White respondents (10) had had police contact in the form of a street stop within the past 12 months; 80.8% of non-White respondents (42) had not. For White respondents, 10.3% (20) had had police contact in the form of a street stop within the past 12 months; 89.7% of White respondents (175) had not. To note, the small number of non-White respondents raises a question of validity for that segment of the sample. Further research would benefit from having a larger number of respondents and a similar number of White and non-White respondents.



**H2: The number of traffic stops for non-Whites is greater than the number of traffic stops for Whites.**

In H2, the dependent variable was traffic stops and the independent variable was race. Traffic stops were measured by “yes” or “no” responses, and race was measured by respondents either being “White” or “non-White.” Out of 247 respondents, 72 (28.8%) said they had had a traffic stop within the past 12 months of them taking the questionnaire. In order to test the association of traffic stops and race/ethnicity, a Chi Square analysis was used to measure

that race might not have played a role in traffic stops based on the experiences of the respondents. As stated previously, the small number of non-White respondents raises a question of validity for this part of the research.

**H3: Non-White college students have a less favorable attitude toward police than White students.**

In H3, the dependent variable was attitude (toward police) and the independent variable was race. Race was measured

**Table 1**  
*Chi-Square Tests on Race (non-White & White) and Street Stops*

Street Stop	non-White (N= 52)		White (N=195)		$\chi^2 (1)$	p
	n	%	n	%		
No street stop contact	42	80.8%	175	89.7%	3.099	.078
Street stop contact contact*	10	19.2%	20	10.3%	3.099	.078

\* = within the last 12 months of when the survey was taken

the nominal variables in H2. The test found no significant connection between traffic stops and whether the respondent identified as White or non-White because the p-value was greater than .05 alpha ( $p > .05$  alpha). While this test illustrates the lack of association between race and traffic stops, it is superficial, in a sense. The basis for these respective stops is reported at the discretion of the respondent, and is limited by the quantitative focus of the research. A more qualitative approach could provide further insight into the events of the stop.

The results of this analysis show that 28.8% of non-White respondents (15) had had police contact in the form of a traffic stop within the past 12 months; 71.2% of non-White respondents (37) had not. In regard to White respondents, 29.2% (57) reported police contact in the form of a street stop within the past 12 months; 70.8% of White respondents (138) did not. The percentages of non-Whites and Whites who had a traffic stop within the previous 12 months are relatively similar (28.8% and 29.2%, respectively), which implies

by respondents either being “White” or “non-White.” Attitude (toward police) was measured by combing three related questions. By combining such like-variables, a more precise estimation of the impending test analyses can be made, as the more closely related questions are to one another in a test analysis, a relationship can be better illustrated. The correlation of these questions was tested by Cronbach’s Alpha, a measure used to determine the relation of items (in this case, questions) and whether their internal consistency can create a reliable scale.

The Cronbach’s Alpha for this scale was .813, suggesting that the three items have a high consistency with one another (the closer to 1.0, the higher the consistency). The three items added up to create a new variable called “attitude.” Attitude was gauged between a scale of 3-17 (3 being the lowest possible score out of the three questions and 17 being the highest). Lower scores represented more negative attitudes toward police and higher scores represented

more positive attitudes toward police (M=12.3439, SD=2.94149).

To investigate this hypothesis, an independent t-test was run (Table 3). A t-test was used because the independent variable is binary (non-White students or White students) and because the hypothesis is concerned with the differing attitudes between the binary racial groups (non-White students and White students). An independent version of the t-test was used because the two means have only been measured once and because the dependent variable is deemed to be continuous. The t-test produced 34 non-White responses (M=11.3235, SD=2.76033) and 154 White responses (M=12.5714,

streets stops and traffic stops). The result is a variable that is dichotomous: “non-contact” (the newly created definition consisting of the two combined variables) means that there has been no police contact (no street stops or traffic stops) in the last 12 months and “contact” means that an individual experienced a street stop or a traffic stop within the last 12 months of when the survey was taken. Approximately 61% (150 respondents) said they had no contact with police in the last 12 months, and 38.8% (97 respondents) said they had experienced a street stop or traffic stop within the last 12 months.

**Table 2**  
*Chi-Square Tests on Race (non-White & White) and Traffic Stops*

Traffic Stop	non-White (N= 52)		White (N=195)		$\chi^2$ (1)	p
	n	%	n	%		
No traffic stop contact	37	71.2%	15	28.8%	.003	.957
Traffic stop contact contact*	138	70.8%	20	29.2%	.003	.957

\* = within the last 12 months of when the survey was taken

SD=2.95026). The p-value (done in the t-test of equality of means) with equal variances assumed is .025 (t-observed=-2.257, df=186), which is less than the .05 alpha level used to gauge the hypothesis ( $p < .05$ , alpha = .05). Therefore, the null hypothesis (no statistically significant relationship between race and attitude toward police) is rejected. Further, difference in attitudes (toward police) between non-Whites and Whites is statistically significant, as non-White respondents, had (on average) an attitude (toward police) that is more negative than White students.

**H4: Contact in the form of street stops or traffic stops negatively affects attitudes toward police.**

In H4, the dependent variable was attitude and the independent variable was contact. Attitude was measured by using three related questions and was validated by the Cronbach’s Alpha measure. “Contact” was created by adding two variables together

To investigate the hypothesis, an independent t-test was run (Table 4). A t-test was used because the independent variable is binary (respondents either had contact with police within the past 12 months or they had not) and because the hypothesis is concerned with the respondents’ differing attitudes (like in H3, “attitude” in H4 is one variable). An independent version of the t-test was used because the two means have only been measured once and because the dependent variable is deemed to be continuous. The t-test produced 117 respondents who had “no contact” with police within the past 12 months (M=12.7778, SD=2.66882) and 72 respondents who had “contact” (M=11.6389, SD=3.23409). The p-value (done in the t-test of equality of means) with equal variances assumed is .009 (t-observed=2.625, df=187), which is less than the .05 alpha level used to gauge the hypothesis ( $p < .05$ , alpha = .05). Therefore, the null hypothesis (there is no statistically significant relationship between contact and attitudes toward police) is rejected. Further,

difference in attitudes between those who had “contact” within the past 12 months and those with “no contact” is statistically significant, as people who had contact reported a more negative attitude toward police.

**Discussion**

The statistical analysis of the first hypothesis did not find a relationship between race and street stops (as evidenced by Chi

stops. The second hypothesis of this research was unsupported. The reasons for the unsupported hypothesis finding is beyond the scope of this particular research; future research could seek to answer this question by garnering a larger non-White sample size.

The third hypothesis anticipated that non-White college students would have a less favorable attitude toward police than White students, and this hypothesis was correct: on average, non-White students had a more negative attitude toward police. According

**Table 3**  
*Group Statistics and Independent Samples Test of Attitude and Race (non-White & White)*

	non-White (N= 34)		White (N=154)		df	t	p
	M	SD	M	SD			
Attitude	11.3245	2.76033	12.5714	2.95026	186	-2.257	.025*

\*= p > .05

Square analysis), so the first hypothesis of this study was incorrect. To note, though, about 20% of non-White students had endured a street stop, while only 10% of White students had endured a street stop. According to Durose & Langton’s (2013) data, White Americans and non-White Americans were found to have nearly identical percentages for street stops. In this study, the percentage of non-White students who were subject to a street stop was nearly twice as much as their White classmates. Due to the differing implications between the statistical analysis and the casual observation, it is difficult to make an assertion about the non-White students in this study due to their sample size and their relationship with police without looking at other variables and other statistical analyses (Tillyer & Engel, 2013).

The difference between non-Whites and Whites stopped via traffic stops in this study was minimal; non-Whites were stopped via a traffic stop 28.8% of the time and Whites at 29.2%. In a sense, this study’s findings on traffic stops is antithetical to previous research (notably Ridgeway, 2006 and Durose & Langton, 2013) because a higher percentage of Whites in this study were subject to traffic

to Kerner et al. (1968) and Higgins et al. (2010), negative perceptions and bad experiences with police can be derived from previous bad relations between police and certain races; therefore, the unmeasured assortment of vicarious experiences could have resulted in this finding, since, statistically speaking, White students and non-White students in this study reported similar empirical experiences with traffic stops.

The fourth hypothesis of this study was confirmed by a statistically significant t-test: contact (in the form of street stops or traffic stops) negatively affects attitudes toward police. According to the ruling in Floyd, et al. v. City of New York, et al. (2013), many stop-and-frisks in proactive policing communities are deemed to be “fruitless” and “inefficient time wasters,” which can upset people after such stops. Additionally, the notions used to describe the previous finding can be used to explain this one as well: vicarious experiences can influence people to have more negative attitudes toward police (Higgins et al. 2010; Kerner et al., 1968).

**Limitations**

This research, although useful because it provides a quantitative snapshot of police-citizen interactions in southeastern Massachusetts for college-age students, only had about 250 respondents. The quantity of respondents in conjunction with the centralized ages of respondents being in the low 20's indicate that the population is not representative of the region. The small sample size of non-White students is not ideal, even though there was a larger percentage of non-Whites in this study than at Bridgewater State

second research question, about attitudes toward police, the findings were statistically significant. On average, non-White students had a more negative attitude toward police than White students. Street stops and traffic stops by police were correlated with less favorable attitudes toward police. About 50% of non-Whites reporting having police contact, and only 40% of Whites had such contact; non-White respondents may have reported a less favorable view of police because they had a greater percentage of exposure to such stops.

Further research is warranted, especially in order to study

**Table 4**  
*Group Statistics and Independent Samples Test of Attitude and Contact (street stops & traffic stops)*

	no contact (N= 117)		contact (N=72)		df	t	p
	M	SD	M	SD			
Attitude	12.7778	2.66882	11.6389	3.23409	187	2.625	.009*

\*= p > .05

University in 2013. The questionnaire did not enable respondents to elaborate on their experiences, nor can the statistical analyses expound on such experiences, so the study's findings are limited strictly to the questions asked. This can be particularly limiting (although still useful in the general literature, as Pollock stated in 2014) because Higgins et al. (2010), Tillyer & Engel (2013), and Warren (2010) have found in their respective research that there is much more to a person's experience with police than the types of questions asked for this research (e.g., external factors that influence a police contact). Future research should seek to look into these external factors.

**Conclusion**

This study serves to improve understanding of undue police misconduct involving race and ethnicity. This study found that street stops and traffic stops, based on statistical analysis, did not occur only because of a person's race/ethnicity. With regard to the

a congruent sample of non-White and White respondents and to ask how respondents feel about race relations more generally, as Higgins et al. (2010) found race relations to be important in police-citizen interactions. There are two main reasons to build on the type of approach used in this study to measure police-citizen relations: research could possibly identify the next "Ferguson" before it happens, and constant research of this sort is needed in order to understand the ever-changing police-citizen dynamic (Pollock, 2014). Future research could alternatively pursue methods more synonymous with studies by Zhao et al. (2015) and Tillyer & Engel (2013), which looked into various personal attributes (beyond citizens' race/ethnicity) that may cause undue police contact. Likewise, intricacies in police protocol could be studied, to build on Ridgeway's (2006) finding that undue police behaviors can occur within particular points of complex policies and protocols.

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## About the Author



Gary Portway graduated summa cum laude from Bridgewater State University in December 2015 with a bachelor's degree in Criminal Justice. His research project, conducted as his honors thesis, was completed in the Fall 2015 semester under the mentorship of Dr. Jennifer Hartsfield (Criminal Justice). This project was made possible with a semester grant from the Office of Undergraduate Research. Gary presented this research at the 2015 American Society of Criminology conference in Washington, D.C. He plans to continue his education by pursuing a master's degree in the fall of 2016.

# Discovering How the Pieces Fit Together: An Interdisciplinary Research Project Integrating the Disciplines of Elementary Education and English

ANGELA SKRABEC

## Introduction

When I began my research project roughly two and half years ago, I had one main goal in mind: to find out the reasoning behind Massachusetts mandating Elementary Education majors, like myself, to have a second major in the sciences or the humanities. My mind was consumed with the fact that I wanted to become an elementary school teacher, so why in the world would the state require me to have two complete undergraduate degrees when I would really only use my degree in education? This question is what sparked the whole idea of performing an interdisciplinary undergraduate research project. The purpose of my study was to become an expert on the initial interaction between Native Americans and English explorers in the

New World during the 1600s and then to apply my knowledgeable background of first encounters to selecting high quality children's literature written from multiple perspectives to create a text set to be used in a fifth grade classroom.

Throughout my research, the lines of separation between my two majors became blurred as I constantly crossed over critical and close reading techniques I had learned from both my Elementary Education and English majors, found opportunities to incorporate college level English texts into the elementary classroom, and discovered the importance of building a solid background on historical events prior to developing a text set to be used in the classroom. All of a sudden, my double major became a unified blend of equal parts Elementary Education and English. I could clearly see how an English degree fit into my future career as a classroom teacher. By the conclusion of my project, it had become less about the state requirement for education majors to have a second major in a content area and more about preparing myself to become the best possible educator.

## Introduction to the Study

The initial interaction between Native Americans and English explorers in the New World during the 1600s is a topic mandated by the Massachusetts Curriculum Frameworks to be covered in the fifth grade. Textbooks often provide students with a single perspective of the First Encounters, usually from the English colonial perspective, but rarely show the complicated reality of the historical occurrences. In addition to studying and compiling a list of texts appropriate for use in the fifth grade classroom, my study examined the influence that a knowledgeable background of First Encounter texts has upon the quality, multi-perspective children's literature brought into a fifth grade classroom.

*United States and Its Neighbors: Social Studies for a Changing World* is a fifth grade textbook used in Massachusetts Public Schools (Appendix A). This text presents the encounter in a basic, one-dimensional manner. The interaction between the two groups is introduced by claiming "One day, an Indian walked into Plymouth.

To the surprise of the colonists he said ‘Welcome!’ and asked for a drink” (Banks et al. 2005). The text treats the encounter as if the natives just happened to stumble upon the colony of Plymouth and made the decision to aid the English by teaching them how to plant and grow food. The idea that the colonists are the ones who arrived and took the land away from the Indians is not even remotely mentioned. In a later chapter, King Philip’s War and the Pequot War are explained in three small paragraphs by giving a quick account of what happened without digging deeper to expose the tensions and emotions surrounding these wars. No primary sources are referenced in these lessons. The text neglects to fully explain and expand upon the cultural knowledge and practices that the English and the Indians brought to these encounters. The religious beliefs of the English are mentioned in an earlier chapter, however are not recalled in these passages or brought into connection with the encounters. The one sub-topic that the text does a thorough job of explaining is the differing views of land ownership that the Indians and the English held. It sets up a debate between the two sides and shows students the arguments of both. Overall, what this textbook is missing is a multi-perspective, in-depth explication of the cross-cultural experience that occurred between the Indians and the English during the First Encounters. It was with this evidence in mind that I saw a need and proposed that, through the completion of my research project, I would be able to supplement the information found in the textbook with quality children’s literature that would give students a comprehensive, multi-perspective view of the First Encounters.

This interdisciplinary research project integrated training and techniques from two disciplines: English and Elementary Education. The purpose of the project was to immerse myself in the scholarly study of First Encounter (encounters between the natives and English settlers in the New World) texts in order to create a fifth grade text set, a selection of approximately twenty to twenty-five quality children’s books that represent a diverse range of reading levels and genres. My research entailed reading a variety of First Encounter literatures and using New Historicism to analyze each as part of my English scholarship. In addition, after reviewing research

on literacy education, particularly reader response theory and critical literacy, I developed a fifth grade text set on the First Encounters.

### **My Text Set: “First Encounters: An In-Depth Look at Native/Settler Interactions in New England with a Broad Overview of Native/Settler Interactions across North America”**

At the culmination of my research project, I produced a fifth grade text set on the First Encounters. The text set includes 21 texts from multiple genres including children’s books, novels, and digital texts (Appendix B). All of the children’s literature ranges in reading level from kindergarten through eighth grade. In this First Encounters text set, the texts are broken up into smaller categories within the broader topic. There are six categories with a timespan that starts with Columbus in 1492 all the way through to the late 18th century, covering many Native American First Encounters across North America. Each text was scored using a rubric that I developed and inter-rater reliability to diminish personal bias. Only texts which scored an overall rating of either ‘excellent’ or ‘good’ on the rubric were included in the text set.

### **Development of Rubric**

In order to determine which texts were exemplary, my Elementary Education mentor and I developed a rubric that would analyze potential supplemental texts for cultural authenticity and historical accuracy as objectively as humanly possible. To begin, I looked at other rubrics from the field of Elementary Education and the field of literacy education which had similar goals in mind: rating children’s literature on an objective scale of Excellent, Good, or Poor. Using my critical literacy skills from both my English and Elementary Education disciplines, I tried to answer questions such as: Who is the author of this book? What makes him/her qualified to write about Native peoples? How would a Native American child feel after reading this book? The next and final step was stumbling upon the website of Oyate (means “The People”), a Native American/American Indian advocacy and educational organization. Using criteria adapted from *How to Tell the Difference* by Doris Seale,



Beverly Slapin and Rosemary Gonzales, my mentor and I developed a rubric.

### Use of the Rubric

Supplemental texts were analyzed using a six page rubric (Appendix C) which looked at several categories such as historical

text was then given based upon the majority rating among all thirteen categories. In order to make this rubric as objective as possible, my Education mentor and I used inter-rater reliability where we would both separately read and analyze the texts using the rubric and then discuss our ratings and reasoning behind the rating that was given.

Book Title:		Date of Publication:	
Author:		Grade Level/Reading Equivalency:	
Illustrator:			
Criteria	Quality Rating		
<b>Look for Stereotypes:</b>  Questions to consider... <ul style="list-style-type: none"> <li>• Are Native peoples portrayed as savages or uncivilized?</li> <li>• Are Native peoples portrayed as extinct?</li> <li>• Are Native Societies oversimplified and generalized?</li> <li>• Is the overall design aesthetic of the book “generic Indian”?</li> </ul>	<b>Excellent:</b> Native peoples are consistently shown as human beings, members of highly defined and complex societies. Native societies are always presented as separate from one another, with each culture, language, religion, and dress being unique to its tribe. The overall design of the book is accurate and appropriate to the tribe(s) being discussed.	<b>Good:</b> Native peoples are generally shown as human beings, members of highly defined and complex societies. Native societies are presented as separate from one another, but the distinctions are loosely discussed blurring the differences between one tribe and another. The overall design of the book is generally accurate and appropriate to the tribe(s) being discussed.	<b>Poor:</b> Native peoples are shown as sub-human beings, members of generalized, simplistic societies. Native societies are grouped together under one generic category without distinction between each of the various tribes. The overall design of the book is inaccurate and/or inappropriate to the tribe(s) being discussed.
<b>Look for Loaded Words:</b>  Questions to consider... <ul style="list-style-type: none"> <li>• Are there insulting overtones to the book’s language?</li> <li>• Does the book include insulting terms such as <i>Injuns</i>, <i>primitive</i>, and <i>savage</i>?</li> </ul>	<b>Excellent:</b> Language is consistently respectful and worthy of use in reference to any and all other technologically advanced person or group of people.	<b>Good:</b> Language sometimes departs from respectful words that would be offensive if used in reference to any technologically advanced person or group of people.	<b>Poor:</b> Language is consistently disrespectful and would be offensive if used in reference to any technologically advanced person or group of people.

**Figure 3. Excerpt from my developed rubric. See Appendix C for full rubric.**

representation and the role of elders. Each category featured guided critical questions which were specific to that particular category. A scale of excellent, good, and poor was used to rate each category. Figure 3 shows an excerpt from the rubric. This ensured that texts with one poor rated category would not receive an overall lower text rating. In addition, at the bottom of each rubric, author and illustrator information was provided as well as notes on the strengths, concerns, and suggested classroom uses of the text. An overall rating of the

### Discussion

#### Selection of Texts

In the English discipline, my mentor and I shared the responsibility of selecting First Encounters primary and secondary sources to form the basis of my knowledge of the First Encounters. I had read a few of the texts before when I had taken her Early American course, but most of the texts were new to me. Our goal was to locate a variety of texts written during the time period as well

as after the time period, so that my foundational knowledge on the First Encounters was developed from multiple points of view (i.e. colonists, Native Americans, varied socioeconomic status, men, and women) to give me the most accurate picture possible.

Choosing texts to be included in my text set was a lengthy process filled with several weeks of research and of course reading. I gathered as much information and knowledge on the topic of First Encounters as I possibly could. I sought advice from one of my English professors who happens to be of Native American descent, consulted professional texts for elementary educators (i.e., *Broken Flute*), and researched online using children's literature databases. With the help of my mentors, I came to define 'texts' very broadly including books as well as pictures, maps, audio-visual presentations, or artifacts. Although children's books made up the major category of texts that I analyzed, I did evaluate other texts such as a children's coloring book and a Plimoth Plantation DVD. All of the texts that were selected as part of the text set were analyzed using my self-developed rubric that reviewed the texts on their culturally authenticity and historical accuracy of the First Encounters.

## Experiences

During my research experience, I had the opportunity to undergo a unique undergraduate research experience. My project incorporated dual elements from English and Elementary Education which allowed me to explore the usefulness of an English background in the Elementary classroom. I loved having the multi-perspective outlook as I read English texts in search of historical truth that would help me to better understand the circumstances of the Pilgrims and Wampanoag Natives living in the New England area. With a deep understanding of the First Encounters between the two sides, I was able to develop a First Encounters text set that would share my new historical knowledge with elementary students on a developmentally appropriate level. The line of separation between my two disciplines became forever erased with the experience of my interdisciplinary undergraduate research project.

Prior to this project, I had never experienced the role of

actively participating in my disciplinary field of English. I read all the time for my English courses and discussed literature on a regular basis, but the reading and discussion for my project was different. Instead of being handed a list of texts to be read, my mentor and I selected sources together. I got to go inside Governor William Bradford's head when I read *Of Plymouth Plantation*, and I took a side in King Philip's War while reading Jill Lepore's *In the Name of War*. These texts brought history alive through their detailed descriptions of war, captivity, and colonial/native relations. Reading different primary and secondary sources each week allowed me to thoroughly research a very complex time in America's history. My foundation of First Encounters knowledge grew on a weekly basis with my reading, reflections, and meetings with my mentor. After reading each text, I had the outlet of my blog to analyze and review the texts. At our weekly meetings, the one-on-one discussions of texts were complex and thought-provoking. I would read a text for the week and come to the meetings ready to share my opinions. Sometimes I would walk in the door having strong feelings against something and by the time I walked out my feelings had totally shifted. Having face-to-face conversations with a scholar in the field (my mentor) made me realize that I was a part of the English community. No longer was I just sitting in a classroom taking college English courses, but I was actually performing scholarly research in the field.

Throughout the project, I took on the role of an elementary teacher whose responsibility is to teach to state curriculum standards using the best practices, such as reader response theory and critical literacy. My elementary education mentor and I reviewed the fifth grade social studies textbook and came to a consensus that supplemental materials were needed to provide students with a comprehensive point of view on First Encounters. My job was to develop a text set that would meet the fifth grade curriculum standards while still giving students a historically accurate and cultural authentic perspective on First Encounters. My mentor from the field of Education facilitated this goal by assisting me in taking my solid foundation of knowledge on the First Encounters and applying this knowledge to finding the best First Encounters texts that the world of children's literature has

to offer. With the guidance of my Elementary Education mentor, I researched using the Comprehensive Children's Literature database, collected potential texts from all over the Southeastern Massachusetts library network, and then realized that I needed a regulated system of rating the texts that I found. Being a future teacher, I worked with an expert in the field of Elementary children's literature (my Elementary Education mentor) to create an extensive rubric (6 pages in length) so I could score each text against the same criterion. It was a process to go through countless children's texts just find the best twenty-two First Encounters children's texts available, but it was well worth it. These experiences are exactly what an elementary teacher goes through when they are planning a new unit of study and need great supplementary materials to balance the information from the textbook. This research project was a realistic experience of what it is like as an elementary educator.

### **Concluding Insights**

Despite what people might think, educators do not have the summers off. Last summer, I spent ten weeks developing my text set on the First Encounters and continued my analysis throughout the academic year. As a classroom teacher, I envision my summers as researching, planning, and developing great text sets that will supplement the information that is in subject area textbooks. I have seen the value of thoughtfully creating a text set that includes historically accurate and culturally authentic texts. I truly believe that text sets are a great way to teach students new information. The state puts a lot of pressure on educators to meet the curriculum standards, but why not achieve the standard by introducing children to non-fiction picture books, providing students with culturally appropriate coloring pages, and showing them historically accurate representations of events from America's history? Educators have an obligation to teach to the standards, however, interesting and engaging presentations of material still can be achieved. Learning about the benefits of using reader response theory and critical literacy in the elementary classroom made me an advocate for educating students on how to closely read and question texts. Students as young as seven

can begin to view themselves as active readers who have a say in how they understand information presented in a text.

College level primary sources can also be used in the elementary classroom. Before this project, I would have never thought to incorporate a text that I read in my junior year of college into a fifth grade elementary unit on the First Encounters. Now, I cannot imagine teaching colonial captivity during King Philip's War to my future students without using Mary Rowlandson's text. This text would give students a raw perspective of a pastor's wife who spent months as a captive of the Wampanoag Indians. Granted the vocabulary may be a bit challenging, but I can thoughtfully select excerpts from primary source documents to use as learning tools for elementary students. It is so powerful to share a text that was written over four-hundred years ago by a person who lived during the time period and who actually experienced the event that we are now reading about in our social studies textbooks. There is no better way to learn about history than through the eyes, ears, and mouth of the people who lived that reality.

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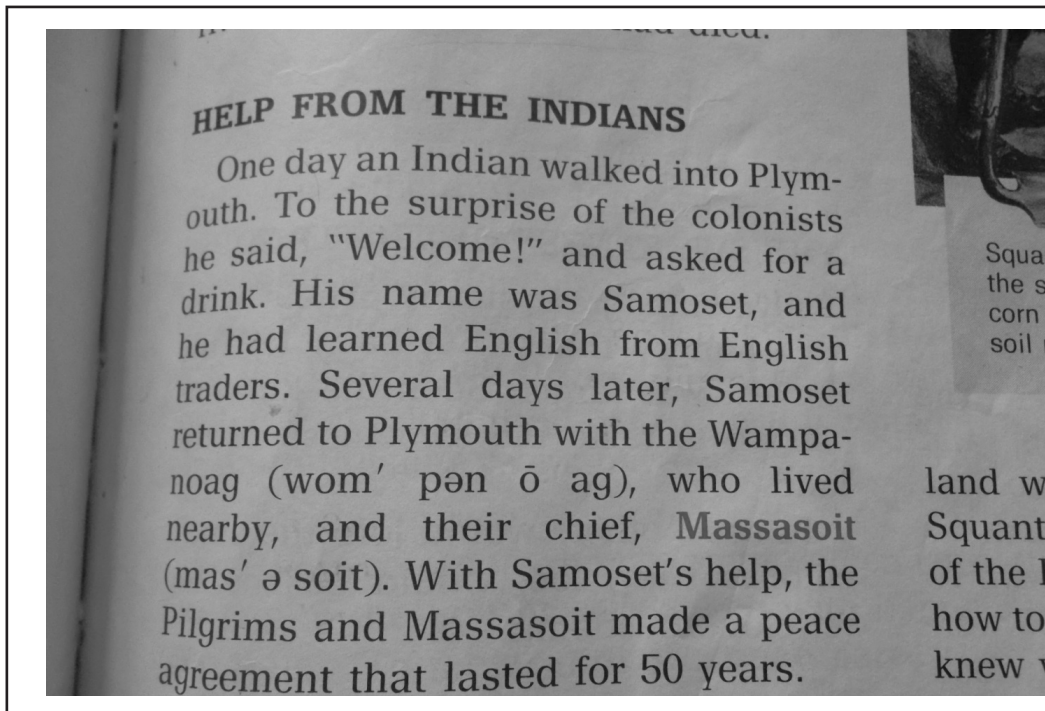
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## About the Author



Angela Skrabec graduated from Bridgewater State University in Spring 2015 with a bachelor's degree in Elementary Education and English. She graduated Summa Cum Laude with Departmental Honors. Her research project began in Summer 2014 as part of the Adrian Tinsley Program for Undergraduate Research. Under the dual mentorship of Dr. Jennifer Manak (Elementary Education) and Dr. Ann Brunjes (English), this interdisciplinary project was completed as an Honors Thesis in the spring of 2015. Angela is currently pursuing a career in the field of Elementary Education.

## Appendix 1



## Appendix B

### First Encounters: An In-Depth Look at Native/Settler Interactions in New England with a Broad Overview of Native/Settler Interactions across North America

Categories	Children’s Literature	Scholarly Texts from the English Discipline which Inform Children’s Literature Selections
Columbus 1492 – 1619	<p><i>A Coyote Columbus Story</i> (King, 1992)</p> <p><i>Morning Girl</i> (Dorris, 1992)</p>	<p><i>After Columbus: Essays in the Ethnohistory of Colonial North America</i> (Axtell, 1988)</p> <p><i>Indian New England Before the Mayflower</i> (Russell, 1980)</p> <p><i>Rethinking Columbus</i> (Bigelow and Peterson, 1998)</p>
Mayflower- English settlers who established Plymouth  1620	<p><i>Dear America: The Diary of Remember Patience Whipple</i> (Laksy, 1996)</p> <p><i>Thunder From the Clear Sky</i> (Sewall, 1995)</p>	<p><i>Mayflower</i> (Philbrick, 2006)</p> <p><i>Of Plymouth Plantation 1620-1647</i> (Bradford, 1981)</p>
Native/Colonial Encounters- Interactions between Native Americans and English settlers during the first two years of settling Plymouth including the “First Thanksgiving”	<p><i>1621: A New Look at Thanksgiving</i> (Grace and Bruchac, 2001)</p> <p><i>1621: Beyond the Myth of the First Thanksgiving</i> (Plimoth Plantation)</p> <p><i>Giving Thanks: The 1621 Harvest Feast</i> (Waters, 2001)</p>	<p><i>Mayflower</i> (Philbrick, 2006)</p> <p><i>Of Plymouth Plantation 1620-1647</i> (Bradford, 1981)</p>

<p>1620 – 1621</p>	<p><i>Guests</i> (Dorris, 1994)</p> <p><i>Squanto's Journey: The Story of the First Thanksgiving</i> (Bruchac, 2000)</p> <p><i>Thanksgiving: The True Story</i> (Colman, 2008)</p> <p><i>Thunder From the Clear Sky</i> (Sewall, 1995)</p>	
<p>Native American Tribes of New England- An overview of prominent Native American tribes living in the New England region</p>	<p><i>Crossroads America: Cultures Collide: Native Americans and Europeans 1492-1700</i> (Rossi, 2004)</p> <p><i>Malian's Song</i> (Bruchac, 2005)</p> <p><i>Tapenum's Day: A Wampanoag Indian Boy in Pilgrim Times</i> (Waters, 1996)</p> <p><i>The Pequot Tribe</i> (Lassieur, 2002)</p> <p><i>The Wampanoag of Massachusetts and Rhode Island</i> (Levy, 2005)</p>	<p><i>Early Native Literacies in New England: A Documentary and Critical Anthology</i> (Bross and Wyss, 2008)</p>
<p>Rising Tensions between Natives and Colonists- Coverage of the Pequot War and King Philip's War including cause(s) and effect(s)</p>	<p><i>King Philip's War: The Conflict over New England</i> (Mandell, 2007)</p> <p><i>Thunder From the Clear Sky</i> (Sewall, 1995)</p>	<p><i>Colonial American Travel Narratives</i> (Martin, 1994)</p> <p><i>Good Wives: Image and Reality in the Lives of Women in Northern New England 1650-1750</i> (Ulrich, 1980)</p>

		<i>The Name of War: King Phillip's War and the Origins of American Identity</i> (Lepore, 1998)
<p>First Encounters across North America- Encompasses a broad spectrum of different Native American/Settler interactions NOT specific to the New England region</p>	<p><i>1607: A New Look at Jamestown</i> (Lange, 2007)</p> <p><i>Black Elk's Vision: A Lakota Story</i> (Nelson, 2010)</p> <p><i>Crossroads America: Cultures Collide: Native Americans and Europeans 1492-1700</i> (Rossi, 2004)</p> <p><i>Seneca Coloring Book</i> (Snow, Waterman, and Watt, 1979)</p> <p><i>The People Shall Continue</i> (Ortiz, 1994)</p> <p><i>The First Peoples of Ohio and Indiana: Native American History Resource Book</i> (Diemer-Eaton, 2013)</p>	<i>The Barbarous Years: The Peopling of British North America: The Conflict of Civilizations, 1600-1675</i> (Bailyn, 2012)

*Critical Literacy: Enhancing Students' Comprehension of Text* (McLaughlin and DeVoogd, 2004)



## Appendix C

Book Title:

Date of Publication:

Author:

Grade Level/Reading Equivalency:

Illustrator:

Criteria	Quality Rating		
<p>Look for Stereotypes:</p> <p>Questions to consider...</p> <ul style="list-style-type: none"> <li>• Are Native peoples portrayed as savages or uncivilized?</li> <li>• Are Native peoples portrayed as extinct?</li> <li>• Are Native societies oversimplified and generalized?</li> <li>• Is the overall design aesthetic of the book “generic Indian”?</li> </ul>	<p>Excellent: Native peoples are consistently shown as human beings, members of highly defined and complex societies. Native societies are always presented as separate from one another, with each culture, language, religion, and dress being unique to its tribe. The overall design of the book is accurate and appropriate to the tribe(s) being discussed.</p>	<p>Good: Native peoples are generally shown as human beings, members of highly defined and complex societies. Native societies are presented as separate from one another, but the distinctions are loosely discussed blurring the differences between one tribe and another. The overall design of the book is generally accurate and appropriate to the tribe(s) being discussed.</p>	<p>Poor: Native peoples are shown as sub-human beings, members of generalized, simplistic societies. Native societies are grouped together under one generic category without distinction between each of the various tribes. The overall design of the book is inaccurate and/or inappropriate to the tribe(s) being discussed.</p>
<p>Look for Loaded Words:</p> <p>Questions to consider...</p> <ul style="list-style-type: none"> <li>• Are there insulting overtones to the book’s language?</li> <li>• Does the book include insulting terms such as <i>Injuns</i>, <i>primitive</i>, and <i>savage</i>?</li> </ul>	<p>Excellent: Language is consistently respectful and worthy of use in reference to any and all other technologically advanced person or group of people.</p>	<p>Good: Language sometimes departs from respectful words that would be offensive if used in reference to any technologically advanced person or group of people.</p>	<p>Poor: Language is consistently disrespectfully and would be offensive if used in reference to any technologically advanced person or group of people.</p>
<p>Look for Tokenism:</p> <p>Questions to consider...</p>	<p>Excellent: Native Americans are consistently depicted as genuine individuals,</p>	<p>Good: Native Americans are for the most part depicted as genuine individuals, having</p>	<p>Poor: Native Americans are depicted as generic and superficial beings with</p>

<ul style="list-style-type: none"> <li>Do all the Native characters look alike?</li> <li>Do the Natives look like white characters with darker faces?</li> </ul>	<p>having unique and complex qualities and characteristics.</p>	<p>unique and complex qualities and characteristics.</p>	<p>few identifiable qualities and characteristics.</p>
<p>Look for Historical Representation:</p> <p>Questions to consider...</p> <ul style="list-style-type: none"> <li>Is there manipulation of words such as <i>discovery</i>, <i>victory</i>, or <i>massacre</i>?</li> <li>Are Natives represented as responsible for their “disappearance?”</li> <li>Is the United States depicted as “only trying to help?”</li> </ul>	<p>Excellent: History is consistently placed in the proper perspective: the Native struggle for self-determination and sovereignty against the Euro-American drive for conquest and greed.</p>	<p>Good: History is generally placed in the proper perspective: the Native struggle for self-determination and sovereignty against the Euro-American drive for conquest and greed.</p>	<p>Poor: History is placed in the improper perspective: Natives are passively accepting defeat as the helpless victims of Euro-American rule. Natives are presented as being the reason for their own “disappearance.”</p>
<p>Look for Victimization:</p> <p>Questions to consider...</p> <ul style="list-style-type: none"> <li>Does the story encourage children to believe that the Natives accepted unjust treatment and defeat passively?</li> <li>Are Native heroes limited to those who helped the European colonists?</li> </ul>	<p>Excellent: Natives are consistently shown as actively resisting the invaders or as continuing to work for self-determination and sovereignty in present day. Native heroes are always admired because of what they do for their people.</p>	<p>Good: Natives are generally shown as actively resisting the invaders or as continuing to work for self-determination and sovereignty in present day, but sometimes they are shown as the victims. Native heroes are generally admired because of what they do for their people.</p>	<p>Poor: Natives are not shown as actively resisting the invaders or as continuing to work for self-determination and sovereignty in present day. Native heroes are limited to those who helped the European colonists.</p>
<p>Look at the Lifestyles: Cultural and Societal</p> <p>Questions to consider...</p> <ul style="list-style-type: none"> <li>Are Native cultures presented in a condescending manner? <ul style="list-style-type: none"> <li>Are there paternalistic distinctions between “us” and “them”?</li> <li>Are Natives depicted as needing aid from outsiders, and having no ability to govern their own land and people effectively?</li> </ul> </li> <li>Are Native peoples discussed only in the past tense or are</li> </ul>	<p>Excellent: Native peoples are consistently respected and there is a complete understanding of the sophistication and complexity of their societies. The continuity of their cultures is represented. Values, religion, and morals are connected to the present and are depicted as taking people into the future. Religions are discussed accurately. The dwellings depicted</p>	<p>Good: Native peoples are generally respected and there is a general understanding of the sophistication and complexity of their societies. The continuity of their cultures is represented. Values, religion, and morals are semi-connected to the present and are depicted as possibly taking people into the future. Religions are discussed accurately for the most</p>	<p>Poor: Native peoples are disrespected, and there is a lack of understanding of the sophistication and complexity of their societies. The continuity of their societies is not represented. Values, religion, and morals are not connected to the present and are not depicted as taking people into the future. Religions are not discussed accurately. The dwellings depicted are</p>

<ul style="list-style-type: none"> <li>Does it require Native people to adhere to “white” values and standards in order to get ahead or experience success?</li> </ul>	integral to the growth, development, and success of Native peoples.	values are necessary for the growth, development, and success of Native peoples.	growth, development, and success of Native peoples.
<p>Look at the Role of Women:</p> <p>A question to consider...</p> <ul style="list-style-type: none"> <li>Are women completely subservient to men?</li> </ul>	Excellent: Women are consistently depicted as integral and respected participants of Native society.	Good: Women are generally depicted as integral and respected participants of Native society. At times, women are depicted as subservient to men.	Poor: Women are depicted as subservient to men or are not depicted in the text at all.
<p>Look at the Role of Elders:</p> <p>A question to consider...</p> <ul style="list-style-type: none"> <li>Are elders treated as a dispensable burden upon their people?</li> </ul>	Excellent: Elders are consistently treated as loved and valued custodians of the People’s history, culture, and life ways. Elders are depicted as active members of the community who positively contribute to the well-being of society.	Good: Elders are generally treated as loved and valued custodians of the People’s history, culture, and life ways. Elders are sometimes depicted as inactive members of the community who make small contributions to the well-being of society.	Poor: Elders are treated as demanding, nagging, and irritating burdens who hinder the prosperity and well-being of society or are not depicted in the text at all.
<p>Look for the Effects on a Child’s Self-Image:</p> <p>A question to consider...</p> <ul style="list-style-type: none"> <li>Is there anything in the story that would embarrass or hurt a Native child?</li> </ul>	Excellent: There is more than one positive role model with which a Native child can identify.	Good: There is at least one positive role model with which a Native child can identify.	Poor: There are not any positive role models with which a Native child can identify.
Look at Author and Illustrator Backgrounds:			

<p>Questions to consider...</p> <ul style="list-style-type: none"> <li>• Is there an ethnocentric bias that leads to distortions or omissions?</li> <li>• Is the author/illustrator qualified to write about Native peoples?</li> </ul>	<p>Excellent: The author and illustrator's backgrounds qualify them to write about Native peoples. Their perspectives strengthen the work.</p>	<p>Good: The author or the illustrator's background qualifies him/her to write about Native peoples. His or her perspective strengthens the work.</p>	<p>Poor: Neither the author nor the illustrator's background qualifies them to write about Native peoples. Their perspectives weaken the work.</p>
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# 2014 in Black & White: A Measure of Social Policy Attitudes

Femi Stoltz

## Attitudes

### Introduction

In American society, various social and antipoverty policies remain highly controversial among American voters. As one might expect, the relevance of race in relation to such policies can also be quite controversial. Incorporated within this research is an investigation of political attitudes and policy preferences of American voters. Using affirmative action and state welfare spending as dependent variables, I gauge the effects of respondents' race and party identification on policy preferences and other behavior patterns. This measure of attitudes will contribute to a further understanding of race, social and antipoverty policies, and the ways in which these variables interact within the American political system.

Both affirmative action and welfare spending are hot-button political topics among both white and black Americans, though not necessarily for the same reasons. Affirmative action programs tend to lack the support of white voters, as a vast majority of white Americans believe that preferential treatment of minorities is unfair to whites (Swain, 2006). In opposition, as beneficiaries, black voters are more likely to be supportive of such policies. Overall, blacks also tend to be more favorable of redistributive programs than whites; this means that there exists a higher likelihood that black voters will be supportive of social initiatives that include efforts such as increasing state welfare spending than will white voters (Swain, 2006).

## Literature Review

### *Affirmative Action*

There are many Americans who agree that hiring and other personnel actions should be based exclusively on individuals' qualifications or merit relevant to the given position (Nigro & Kellough, 2013). This could perhaps be one reason why affirmative action policies themselves help to embody racist assumptions about minorities (MacDonald, 1993). When policies become entangled with race, individuals may begin to feel more strongly about those policies, as individual opinions on race are typically more tenaciously held, along with being more difficult to alter (Kinder & Sanders, 1996).

Policies which provide for preference in hiring and recruitment practices often lead to racial resentment as non-beneficiaries feel cheated and thus lose motivation (Heilman, 1996). Additionally, the fact that affirmative action gives priority to race over class has only seemed to exacerbate white racism (Kahlenberg, 1995). That is to say that there is a strong belief among whites that if affirmative action policies should exist, the policies should be based on class or income, rather than race or ethnicity (Kahlenberg, 1995). Inevitably, this leaves room for resentment to fester among whites who feel that they are being unduly disadvantaged by the policies.

Other studies regarding the general public's support for affirmative action have found that whites oppose affirmative action policies designed to benefit blacks more than they do affirmative action policies designed to benefit women and individuals with physical or mental disabilities (Wilkins & Wenger, 2014). Despite the fact that a majority of whites endorse racial equality in principle, they do not support public policies in which their main premise is to reduce racial inequality (Banks & Valentino). Support for federal efforts to improve the socioeconomic status of blacks is already lackluster to begin with, but when a policy explicitly provides for special "breaks" for black Americans, white support crumbles (Kinder & Sanders, 1996). Whites typically lack support for such policies and are reluctant to support measures to provide more resources to blacks due to resentment (Kinder & Sanders, 1996).

### **H1) White Americans will be less supportive affirmative action policies**

Black Americans seem to be attached to affirmative action programs and feel that the policies have been somewhat beneficial to blacks (Kinder & Sanders, 1996). However, blacks also believe that they continue to be discriminated against, and they also largely do not believe that they would be hired or promoted while an equally qualified white person is denied a position or promotion (Kinder & Sanders, 1996). Given this interpretation of their current conditions, blacks are more supportive of government policies to reduce racial inequities and otherwise enhance opportunities for blacks in America (Kinder & Sanders, 1996). Additionally, as blacks believe that racism still impedes the process of finding work in America, they are more likely to support government regulation of discriminatory practices in the hiring and promotion processes (Kinder & Sanders, 1996).

Prior to the implementation of affirmative action programs, the black middle class was much smaller, consisting of insignificant numbers of businessmen and other professionals (Steinberg, 1996). However, the number of black Americans now living in the middle class has since risen, an increase that can be directly attributed to the implementation of affirmative action policies (Steinberg, 1996). As black Americans wish to see a continued rise in the number of black business professionals, it is logical that they support government initiatives that will assist in increasing that number. Black voters are more supportive of these types of procedures because they feel that the policies are directly related to their race (Kinder & Sanders, 1996).

### **H2) Black Americans will be more likely to support affirmative action policies**

#### **State Welfare Spending**

Welfare policies remain quite controversial among American voters today as well. A major reason for this controversy stems from the “stereotype of blacks being lazy [which] has a long history in American culture and is [still] implicated in both media portrayals and public attitudes toward poverty and government antipoverty policy” in American society today (Gilens, 173). Welfare policy remains heavily

associated with blacks, despite the fact that most welfare recipients are not black (Gilens). Americans do not like the idea of able-bodied individuals getting assistance from the government when they could be working, and since welfare remains linked to blacks, the policies continue to be frowned upon by a large number of white Americans.

Many whites accept the racist assumption of blacks being lazy due to the fact that they believe that the American economic system is fair. In this belief, the fact blacks remain far behind whites on nearly all wealth indicators is assumed to be due to their work ethic or lack thereof (Gilens, 2000). White Americans specifically perceive blacks as being the most significant minority group among welfare recipients, and their attitudes toward welfare are far more strongly influenced by negative perceptions of blacks than by perceptions of other ethnic groups in the U.S. (Gilens, 2000). This assumption of blacks being lazy also appeals to whites’ justification of the remaining economic advantages that whites have in American society today.

Whites’ opposition to welfare and other social policies also plays an important role in how politicians work toward addressing these issues. For example, when party leaders believe that their support of social policies designed to integrate blacks into American society will lead to a loss of votes among key white voters, their support for the social policy at hand diminishes (Frymer, 2010). Party leaders have an incentive to appeal solely to the majority group of whites, thus keeping the minority group in a position in which they are denied effective access to power and other forms of fundamental decision-making (Frymer, 2010). Instead of creating a nonracial political system, our current system legitimates an agenda that is reflective of the preferences of white voters (Frymer, 2010). This means that the association of certain policies with minorities will also be associated with a lack of support from white voters.

### **H3) White Americans will not be supportive of increased state welfare spending**

Unemployment disproportionately affects blacks in America, with labor statistics frequently showing the black unemployment rate

to be as much as triple the rate of their white counterparts (Swain, 2006). With the disparate number of black Americans living under such conditions, blacks will be more likely to be supportive of social policies designed to help individuals who live at or below the poverty line in America. Minority groups tend to hold more supportive views of government assistance and redistributive policies than do whites (Bowler & Segura, 2011). Additionally, citizens' personal experiences with welfare tend to affect their political attitudes and behavior (Dalton & Klingemann, 2009). As many blacks remain fiscally disadvantaged, their support for antipoverty policies could be due to an association with their own past or present experiences, or even the personalization of the experiences of someone they know. In any event, blacks tend to hold consistently liberal positions with regards to redistributive policies (Bowler & Segura, 2011).

As blacks fall behind whites with regards to access to wealth across a variety of indicators, it makes sense that black voters would be supportive of policies which may ultimately contribute to the overall well-being of black Americans. Additionally, it should also be noted that black and white Americans have yet more differences when gauging whether the economic situation of blacks has changed in America, whether there exist more opportunities for blacks, and whether racism in America has declined (Swain, 2006). Furthermore, blacks tend to feel that the government is morally obligated to provide entitlement programs and are thus more supportive of a government-ensured standard of living (Swain, 2006).

#### **H4) Black voters will be more supportive of increased state welfare spending**

##### **Research Methods**

To assess attitudes toward controversial policies, I use the Cooperative Congressional Election Study (CCES) to apply a variety of statistical analyses to a national stratified sample of respondents. The CCES is administered by YouGov/Polimetrix and consists of two waves during election years. During the pre-election wave, administered late September to late October, voters answer two thirds of the questionnaire questions. Respondents are asked

multiple questions about their demographics, political attitudes, assessment of roll call voting choices, and other political information during this phase. During the post-election wave, voters answer the remainder of the questions from the questionnaire, which mainly focus on the outcome of the recently passed election. This post-election wave occurs in November. Additional surveys collected in non-election years consist of a single wave, occurring in the early fall. ("Cooperative Congressional Election Study," 2015).

With access to CCES data, I ran crosstabs using my dependent and independent variables of interest to assess the statistical significance of specific relationships. In the case of affirmative action, respondents were given a 4-point Likert scale with options ranging from "strongly support" to "strongly oppose" and asked to rate how they felt about affirmative action policies (see Table 1 - AA). In addition to using race as an independent variable, race was also cross-tabulated with party identification for further assessment (see Table 2 - AA/PID). With regards to state welfare spending, participants were given a 5-point Likert scale, in which they were able to choose from options ranging from "greatly increase" to "greatly decrease," and were asked what they felt their state should do about their state's current welfare spending budget (see Table 3 - SWS). Additionally, I again took into account both race and party identification, to assess the roles and relevance of each of these independent variables relevant to the dependent variable, state welfare spending (see Table 4 - SWS/PID).

#### **Findings**

##### **Affirmative Action Policies**

With regards to affirmative action (AA) policies, I assessed responses from respondents who identified as white (N=1,827) and respondents who identified as black (N=314). After weighting the data, I found race to be a statistically significant factor ( $p < 0.001$ ) in Americans' support for AA policies. 29% of white respondents stated that they were supportive of AA policies while the remaining 71% said they opposed such policies. In opposition, 87% of black respondents supported AA policies, while only 13% opposed the

policies. This means that there does, in fact, exist a higher likelihood that white Americans will express opposition to AA policies and practices. On the other hand, it also means that there exists a higher likelihood that black Americans will be supportive of such policies. A brief explanation for the variation in support for AA policies between the two races is that black voters associate such policies with their race while white voters do not, leading to resentment from the non-beneficiaries, white voters (Kinder & Sanders, 1996).

When party identification of white voters is taken into account, there still exists a statistically significant relationship ( $p < 0.001$ ). Of white Democrats, 51% were supportive of AA policies; 24% of white Independents were supportive of the policies; and only 17% of white Republicans reported that they supported AA policies. Essentially, it is notable that party affiliation is also an indicator of whether white Americans will be supportive of AA practices. I found that whites that associate themselves with the Democratic Party are the most likely to be supportive of AA, with just over half of respondents being in support of AA policies. Meanwhile, I found support from both white Independents and white Republicans to be lackluster, with less than a quarter of respondents supporting AA in either case.

Party ID was nearly a statistically significant factor in blacks' support for AA policies ( $p = 0.17$ ) as well. Taking into account party ID of black respondents, I found that 85% of black Democrats were supportive of AA policies, 94% of black independents supported such policies, and 96% of black Republicans reported that they supported AA. As suspected, black voters showed more overall support for AA practices. However, it was surprising to find that blacks who identified as Republicans and Independents were the most supportive of AA policies, being more supportive than black Democrats by 9-11%. This finding is contrary to what I found among white voters when assessing attitudes toward AA and taking party ID into account.

### **State Welfare Spending**

In assessing attitudes on state welfare spending, I again

evaluate responses from white and black voters ( $N = 2,178$ ). I found that there exists a statistically significant relationship between race and attitudes toward state welfare spending ( $p < 0.001$ ). Of white voters, 19% stated that they believe their state should increase welfare spending; 34% said their state's welfare spending should remain the same; and, 47% believed that their state should decrease welfare spending. With nearly half of white respondents believing that their state should opt to decrease state welfare spending, there is room to speculate that the distaste for welfare spending is largely due to their belief that lazy, undeserving, and presumably black welfare recipients are the only individuals benefitting from an increase in state welfare spending.

With regards to welfare spending, 56% of black voters said that their state should increase welfare spending; 33% reported that they felt their state's welfare spending should remain be maintained as it currently is, and only 10% felt that welfare spending should decrease. In this instance, over half of all black respondents would like to see their state of residence increase its welfare spending. The higher level of support from black voters could again be due to the association of such policies with their race and the belief that an increase in welfare spending in their state could contribute to an increased standard of living for black Americans who are in need of assistance (Kinder & Sanders, 1996).

When taking party identification of white voters into account, I found that party ID also plays a significant role in attitudes toward welfare policy as well ( $p < 0.001$ ). Of white Democrats, 35% said they felt state welfare spending should increase, 46% believed that it should be maintained as it is presently, and 19% said they thought welfare spending should decrease. Of white Independents, 18% believed welfare spending should increase, 34% felt it should stay the same, and 48% said it should decrease. Of white Republicans, just 8% said state welfare spending should increase, 22% reported that it should be maintained as it presently is, and 70% believed that it should be decreased. As previous research has revealed in the past, I too have found that both conservatism and identification with the Republican Party contribute to opposition to welfare policies (Gilens, 2000).



There was a nearly significant relationship between party ID and attitudes toward welfare spending for black voters as well ( $p < 0.10$ ). Of black Democrats, 57% believed that their state should increase welfare spending, 33% believed it should be maintained, and only 10% felt it should be decreased. Of black Independents, 42% said they felt that state welfare spending should increase, 47% thought it should be maintained, and 12% thought it should decrease. Of black Republicans, 74% said they believed state welfare spending should increase, 11% said the current spending should be maintained, and 14% said their state should decrease welfare spending. Again, to my surprise, I found black Republicans to be more supportive of a social policy that is largely associated with the Democratic Party. However, overall, blacks are more supportive of increased welfare spending than are whites, regardless of political party identification.

### Implications & Conclusion

After having conducted the necessary research to assess my hypotheses, I found that all four of my hypothesis have held true. With regards to H1, I have found that white voters are indeed less supportive of affirmative action policies, though white Democrats are somewhat more supportive of such practices. In assessing H2, I have also found that black voters are more supportive of affirmative action policies. Moving on to H3, I have found a lack of support for increased state welfare spending among white Americans. Finally, I have also found that black Americans are more supportive of increasing state welfare spending in their respective states of residence.

One potential flaw in this research is the fact that I did not take into consideration the geographic location of respondents. While I am not certain if respondents' state or region of residence would have been a statistically significant indicator as to their feelings regarding the two dependent variables, one could argue about likelihood of support variation from state to state, or region to region. Additionally, I did not formulate hypotheses about the role of party identification relevant to my dependent variables of study, though I believe that my findings with regards to party ID are consistent with

what current researchers of race and politics would have expected to find with regards to the responses of white voters. In opposition, some of my findings are contrary to what I expected to find when assessing the responses of black voters and taking their party identification into consideration. With regards to both affirmative action and state welfare spending, I found black Republicans to be more supportive than black Democrats, a phenomena that I was unable to investigate further, and thus am unable to explain.

I have found that as of the 2014 midterm election, there still exist stark differences with how black and white Americans view different social policies, including affirmative action and state welfare spending. As each group views the policies differently, it is not a surprise that these controversial social policies have varied support among white and black voters, as well as along partisan lines. Whether individuals support or oppose such policies, it remains imperative that researchers continue to measure and understand the reasoning behind such attitudes. While individuals may have their minds firmly made up as to how they feel with regards to race or social policies, current research and relevant literature can often be the only way for individuals of one group to encounter the reasoning behind the feelings and perspectives of individuals who belong to the other group.

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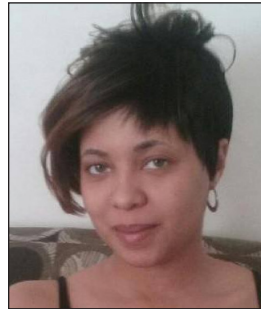
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## About the Author



Femi Stoltz is a graduating senior majoring in Political Science and minoring in Civic Education and Community Leadership. During the time she took off between completing high school and beginning college, Femi became heavily involved in civic engagement. As a mother and full-time honors student, she remains dedicated to community service. Femi is a former AmeriCorps Student Leader in Service and continues to devote herself to encouraging others to become politically and civically engaged. Femi's research was conducted during the summer of 2015 with the guidance of her mentor, Dr. Melinda Tarsi (Political Science) and funding support from the Adrian Tinsley Program for Undergraduate Research. She presented her research findings at BSU's 2016 Student Arts & Research Symposium and the 2016 Massachusetts Statewide Undergraduate Research Conference at UMass-Amherst. Femi intends to pursue further research on educational policy, political polarization, and antipoverty policies. Femi expects to pursue graduate school immediately after completion of her baccalaureate program and plans to use her knowledge of public administration and political science to assist disenfranchised citizens in the greater community.

*Table 1 - AA*

Affirmative Action	White	Black
Strongly support	7%	48%
Somewhat support	22%	39%
Somewhat oppose	26%	10%
Strongly oppose	45%	4%
	N=1,827	N=314

N= 2,492

p<0.001

\*weighted data

*Table 1 - AA/PID*

Affirmative Action	White			Black		
	Democrat	Republican	Independent	Democrat	Republican	Independent
Strongly Support	15%	3%	4%	52%	16%	43%
Somewhat support	36%	14%	20%	33%	80%	51%
Somewhat oppose	29%	22%	26%	11%	4%	4%
Strongly oppose	21%	61%	50%	4%	0%	3%
	p < 0.001			p= 0.17		

Table 1 - SWS

State Welfare Spending	White	Black
Greatly increase	6%	23%
Slightly increase	13%	33%
Maintain	34%	33%
Slightly Decrease	23%	6%
Greatly Decrease	24%	4%

N= 2,178      p= <0.001      \*weighted data

Table 1 - SWS/PID

Welfare*	White			Black		
	Democrat	Republican	Independent	Democrat	Republican	Independent
Greatly increase	13%	3%	4%	19%	8%	21%
Slightly Increase	22%	5%	14%	38%	66%	21%
Maintain	46%	22%	34%	33%	11%	47%
Slightly Decrease	13%	30%	25%	5%	5%	10%
Greatly decrease	6%	40%	23%	5%	9%	2%
	p<0.001			p<0.10		

# Exploring Residents' Attitudes Toward Solar Photovoltaic System Adoption in China

YAQUIN SUN AND STEVEN SPICER

## Abstract

As the world's largest energy consuming country, China is facing environmental deterioration, which results from the overuse of non-renewable conventional energy such as coal. Solar photovoltaic (PV) energy, an unlimited and clean energy with minimal impacts on the environment, is considered a good alternative to alleviate this severe issue. A survey was designed and conducted among residents in some major cities in China: Beijing, Shanghai, Nanchang, and Guangdong. Based on the first-hand data, basic statistical methods were utilized to examine Chinese urban residents' knowledge, concerns, and attitudes about solar PV adoption. The research aimed to identify the drivers and dynamics that most encourage customers to install solar PV systems in their residential buildings. The data suggest that the factors that could increase solar PV adoption are (a) reduced costs, (b) practical government incentives, (c) desire to reduce fossil fuel usage, and (d) education to increase awareness of solar PV systems. This research empirically assesses the impacts of the adoption of solar PV systems on various socio-economic groups.

## Introduction

China not only has the world's largest population of 1.3 billion people, but is also the fastest growing country. The immense population and economic growth in China has led to an increasing

demand for energy. According to Sunpower Corporate Papers (2011), demand is expected to increase by 75 percent by 2035. The conventional energy sources of coal, natural gas, and crude oil generate 69%, 5%, and 18%, respectively, of total energy consumption (Stang, 2014). The overuse of these conventional energies have brought China some adverse environmental impacts such as air and soil pollution, which are hurting public health. According to data released by the Ministry of Environmental Protection, only 9 of 161 Chinese cities (5%) reached the new air quality standards in the first half of 2014 (Xinhua, 2014). The quality of human life in China is threatened without the development of renewable energy sources (Gratzel, 2005). Solar power—sunlight converted directly into energy—is a clean and safe energy source and is regarded as a good alternative to alleviate this serious environmental problem.

In this research study, surveys were randomly distributed among Chinese citizens in June, 2014 in order to learn about public opinion on the value of Solar PV Systems (SPS). The main goal of this research was to analyze the primary data from the survey and to assess which factors are shaping the Chinese solar PV market, especially in terms of Chinese economic, political, and technical development. The survey aimed to understand Chinese citizens' attitudes about installation of solar PV systems (SPS), and when and under what circumstances citizens would consider installing SPS.

## Photovoltaic Effect and Solar Photovoltaic Systems

Photovoltaic energy converts sunlight into electricity through solar photovoltaic (PV) cells. Sunlight consists of photons, or particles of solar energy. These photons contain various amounts of energy with different wavelengths in the solar spectrum. When photons hit a PV cell, they may be reflected, pass through, or be absorbed by the cell. Only the absorbed photons provide energy to generate electricity (Bharat Sanchar Nigam Limited, 2011). Today's most common PV device uses a single-junction type of cell to generate electricity (Knier, 2002). This type of PV cell limits the photovoltaic response to the wavelengths of the solar spectrum. PV cells can only absorb the high-energy photons. The current efficiency

of this type of PV system (multicrystalline-Si and CIGS modules) is around 15%. By using two or more different cells (monocrystalline-Si modules) with more than one junction, the cells can reach over 20% efficiency (Tao, 2014). The cells in research laboratories have recorded efficiency in excess of 40% (Cotal, et al., 2009). Research indicates that the efficiency of solar PV cells will increase greatly in the future.

A solar PV system (SPS) contains multiple photovoltaic modules, referred to as “solar panels” (Muttaqin, 2013). A module consists of small solar cells. A typical single silicon cell produces 1 or 2 watts of power. Generally, one square meter PV module can generate 150 watts of power (Murmson, 2013). The number of solar modules a household needs depends on the region in which they live. According to Mead (2013), people who live in places such as Arizona, where average solar insolation per year is around 6 kWh/meters squared/day, will need 53 square meters (574 sq ft) of 15% efficient solar panels.

One unit of a solar module made in China costs \$800-\$900, making the cost of the whole solar PV module (12 units for a typical single-family home) anywhere from \$4,500 to \$12,000. The power inverter, which converts direct current to alternative current in order to connect to the grid, costs \$1,000-\$3,000 (Rudge, 2010). There are other factors that determine the final cost for a solar PV system, such as the size of the system, the material of the rooftop, and wiring. The total cost of installing a solar PV system can vary widely within different regions due to different domestic markets, local labor and manufacturing costs, and incentive levels.

### **Solar Market**

China is the largest solar panel manufacturer, and it soon will be the largest consumer as well (International Trade Administration, 2014). The solar PV panel market in China has dramatically changed since 2010 (Kaften, 2012). Before 2010, the Chinese government employed massive subsidy programs meant to boost manufacturing and exporting of solar panels (Puttaswamy & Ali, 2013). Furthermore, Chinese production capacity was much

larger than its domestic demand for solar panels. Therefore, China has long been a leader in making and exporting solar panels, with 98% of its product was exported (Puttaswamy & Ali, 2013). However, over-exported solar panels significantly hurt the domestic markets of other countries because the Chinese solar PV panel manufacturers sold their products well below the cost of production. This is the practice known as dumping, which makes the international solar panel market competition unfair. America passed anti-dumping legislation against Chinese solar PV panel manufacturing industries and increased the import duties from 24% to nearly 36% on most solar panels imported from China (Cardwell & Bradsher, 2012). After paying the heavy tariff fee, Chinese solar panel suppliers in the markets of some E.U. countries and the U.S. could barely make a profit (EurActiv, 2013). This trade war caused many of the Chinese solar panel companies to go bankrupt, with large amounts of unsold remnants stuck in warehouses, leading to falling revenues and multibillion-dollar deficits. According to the China PV Industry Alliance, orders of Chinese solar panel equipment decreased by 80 percent in just one year in 2012 (Zeng, 2014).

### **Chinese Policy**

With the pressures of economic growth and environmental deterioration, China is now paying much more attention to its own solar power development. The Chinese government has adopted policies to encourage Chinese citizens to buy solar panels. China’s energy agency has set a goal of supplying 15% of the country’s energy demand with solar power by 2020 and 27.5% by 2050 (Solangi, Aman, Rahim, Fayaz, & Islam, 2012). In order to meet those targets, the Chinese government promulgated a series of laws, policies, and incentives in the last few years (Campbell, 2014). The most significant policies are the following:

- a. The National Development and Reform Commission (Zheng, 2013) stipulates a 20-year subsidy standard for distributed generated PV electricity. Self-generated electricity can receive a subsidy of 0.42 yuan (\$0.07) per kilowatt-hour. Excess electricity

will be purchased by local utility companies at a price between 0.35 and 0.45 yuan/kWh.

b. In some regions with rich solar resources, the price of power generated by PV stations will be lowered to 0.9 yuan or 0.95 yuan/kWh (\$0.15) from the previous national standard of 1 yuan/kWh (\$0.16) (Zheng, 2013).

c. The National Energy Agency allowed energy generated and distributed by a PV project to receive a 0.9-1.0 yuan/kWh subsidy by selling all power to local grids (McCrone, Usher, Sonntag-O'Brien, Moslener, & Gruning, 2013).

These policies provide significant motivation for the development and use of SPS. The policies of the Chinese government can explain the boost in solar power capacity and increased efficiency. According to the Global Status Report, the capacity of solar PV generation increased rapidly from 0.5 Gigawatts (GW) in 2010 to 2.5 GW in 2011, to 7 GW in 2012, and 16.5 GW in 2013 (Sawin, 2013).

## Barriers

Even with significant government support, the adoption of solar PV systems in urban areas in China is limited. One of the possible reasons for the slow adoption could be that policy decisions made by the government vary from the adoption decisions made by householders, who have different concerns, knowledge, and attitudes about this new technology (Islam & Meade, 2013). As the largest population of energy consumers, householders' opinions and attitudes toward SPS adoption could drive the demand and the trend of the market.

## Literature Review

Recent studies have indicated two major factors that tend to determine a customer's adoption of solar panel systems: financial incentives and non-financial reasons. Financial incentives include financial supports provided by central and regional governments. Naveen, Prashant, and Yog (2012) provided empirical evidence to show that government initiatives and institutional finance can strongly

affect the adoption of solar PV power supply systems in developing countries such as India. Richter (2014) concluded that micro-generation technologies are diffused mainly in countries that provide incentives to support installation. Research shows that government policies' design and implementation influence customers' decisions about the adoption of SPS as well as the SPS market's outlook. Jing et al. (2005) found that the incentive policy played an important role in attracting more social media and enhanced the market competitiveness of grid-connected solar PV systems in China. Chemi et al. (2007) examined the potential effectiveness of the renewable energy policy in China and its regulatory law framework, and identified the types of shortcomings that have interfered with more successful expansions of renewable energy in China, based on primary data collected from interviews with stakeholders. Rogol (2007) reported that the rapid growth of Japan's solar power sector was enabled by the interplay of several factors: (a) the extrinsic setting (including the solar resource, interest rate, and grid price), (b) industrial organization (including the structure of the electric power sector and the structure within the solar power sector), (c) demand-side incentives that drove down the "gap" and provided a "trigger" for supply-side growth, and (d) supply-side expansion that enabled significant reductions in costs, which more than offset the decline in demand-side incentives. REN21 (2010) concluded that the PV manufacturing sector of China flourished due to the availability of low-cost loans. Gallagher (2014) showed how government, through market-formation policy, can unleash global market forces. She pointed out that finances presented an obstacle to the development and deployment of cleaner energy technologies, such as SPS, and argued that the biggest barrier is the failure of government-subsidized traditional technology.

Non-financial reasons affecting adoption of PV include social or peer influences (Beiley, et al., 2011), attitudes about innovation (Chen, 2013), and environmental preferences (Bollinger & Gillingham, 2014). Kaplan (1999) first identified the importance of customers' technical knowledge, motivation, experiences, and familiarity influencing their interest in PV. Faiers and Neame (2006) explained that environmental concerns affect household PV system

installation, along with other adoption factors such as financial status, economic concerns, and aesthetic characteristics. Islam and Meade (2013) discussed how the lack of information about the new technology slows the adoption of micro-generation technology using renewable energy. Solangi, Aman and Rahim (2012) suggested that the government should increase use of solar energy, while colleges and graduate schools should promote research in solar energy. Li, Li, and Wang (2013) used surveys to test farmers' purchasing desire as related to certain factors. They showed that concerns about quality of life, government incentives, and word of mouth (favorable comments from friends and neighbors) have significant positive impacts on farmers' willingness to convert traditional houses to solar houses in rural areas. Additional monthly out-of-pocket expenses and switching costs have significant negative impacts. Durability of the system, popularity of PV, timing, and the local solar market's maturity had no significant impacts. Richter (2014) explained that the local environment could influence the social effects on the household PV installation.

There are few papers discussing the adoption of solar energy in urban areas in China by examining primary data. This paper reports on surveys and analysis of the attitudes of Chinese citizens toward purchasing decisions regarding residential solar PV systems.

## Method

A total of 222 Chinese citizens took the survey. They were chosen randomly in the major cities of Shenzhen, Shanghai, Nanchang, Fuzhou, and Beijing. Participants anonymously completed a 12-item questionnaire aimed at understanding the most crucial drivers for customers to consider installing solar panels. The participant group consisted of 50.4% males and 48.1% females. The largest age group was 18-26 years old (64%); 25% were 27-40 years old. There were 43.3% of the respondents who had a monthly income between \$351 and \$850, which would be considered middle class. About 15% of the respondents reported monthly incomes below \$350. A large percentage of the participants, 47.6%, held a bachelor's degree, and 40.6% had graduate degrees. (Please see Table

1 for details of the demographic information)

In this research we used a one-way ANOVA test to compare the means between the different salary groups to determine whether any of those means are statistically significantly different from each other. Specifically, the ANOVA tests the null hypothesis:

where  $\mu$  = group mean and  $k$  = number of groups. If the one-way ANOVA shows a significant result, we accept the alternative hypothesis ( $H_A$ ), which is that there are at least two group means that are significantly different from each other. In this research, we wanted to know whether different salaries would correlate with participants' social concerns, their knowledge about solar panels, and their willingness to adopt solar PV systems. P value determines whether there is a statistically significant difference between different income groups. We assumed that the results would show significantly different results among different income groups, where the p value is less than 0.05.

$$H_0: \mu_1 = \mu_2 = \mu_3 = \dots = \mu_k$$

Some limitations in the population sample may have affected results. Our population sample included mostly residents from the eastern and southern parts of China; a larger sample, taken across the whole country, would be more representative of overall public opinion. In addition, the age of most of our participants was between 18 and 40 years. Sampling from a wider range of age groups might provide different results.

## Results and Discussion

The purpose of this paper is to identify Chinese citizens' concerns and attitudes about purchasing a solar PV system (SPS) and under what circumstances households would adopt SPS. We sampled participants' opinions about SPS in three major areas: (a) knowledge and awareness of SPS, (b) factors driving further development of the SPS market, and (c) barriers preventing the growth of the SPS market.



In the survey, we first asked participants to rank the importance of five social issues in China (Employment, Energy, Safety, Quality of Life, and Education) on a scale of 1-5, where 1 is least important and 5 is most important. Participants ranked Quality of Life and Safety as the top two social issues in China with scores of 3.61 and 3.37, respectively. Energy was considered the least important social issue, with a score of 2.44. These results imply that participants do not consider energy, which could bring pollution, shortages, and climate change, one of the most important social issues in China.

However, participants identified Pollution as the most important subcategory under the issue of Energy, indicating they might not be aware of the strong relationships among energy, pollution, safety, and quality of life. Clean air is crucial to quality of life and good health (Pope, Majid, & Dockery, 2009). Once people realize the links among energy, safety, and quality of life, the solar panel market could be much more promising. According to Roberts (1996), customers want to adopt a “green” product if they have knowledge of the product’s positive contribution to the health of the environment or individuals.

The Cost of Conventional Energy was listed as the least important subcategory under the issue of Energy, as compared with Pollution, Energy Shortages, and Waste of Energy (see Table 3). This suggests that the potential for switching from inexpensive conventional energy to comparatively expensive renewable energy is low; most participants appreciate inexpensive conventional energy. This result is different from the conclusion that one research study, by Somasundaram, Souhib, and Armando (2010) suggested. They explained that competition with the strong conventional energy industry would not be a major concern for participants to adopt SPS. However, the means from Table 3 are not that different from one another, so the interpretation based on the rank ordering is not incredibly meaningful.

The null hypothesis in Table 2 shows that social concerns are independent of the salary groups of the participants. The p values in Table 2 and Table 3 indicate that concerns about Employment, Energy, and Education and the subcategory Waste of Energy are different for participants in different salary groups. The survey suggested that wealthier people are more concerned about Education and Employment and have less awareness of the subcategories Sustainability and Waste of Energy.

In the second part of the survey, we tested participants’ awareness of solar power products, their knowledge of government incentives, and their attitudes toward SPS markets. As indicated in Table 4, most participants were familiar with solar water heaters and solar batteries since they have used these technologies for a long time, but few had used or researched SPS. As Table 5 shows, most

**Table 1**  
*Demographic Characteristics*

<u>Gender</u>	
Male	50.4%
Female	48.1%
Prefer not to answer	1.5%
<u>Education Level Completed</u>	
Below undergraduate	6.5%
Undergraduate	47.6%
Above undergraduate	40.6%
<u>Age</u>	
18-26	64%
27-40	25%
41-60	7%
Over 60	0.9%
<u>Monthly Salary</u>	
Below \$350	14.9%
\$351-\$550	21.4%
\$551-\$850	21.9%
\$851-\$1150	10.2%
\$1151 or more	4.2%
Prefer not to answer	23.3%

participants said they intended to buy solar water heaters and solar batteries in the next five years. Meanwhile, fewer participants showed interest in purchasing SPS within 5 years. This result suggests that awareness of solar products contributes to the solar product market, as participants' knowledge of solar products was correlated with their intention to buy the products. Foxall and Neame (2006) explained that lack of knowledge brought uncertainty and confusion to consumers and therefore decreased consumer interest in purchasing, thereby limiting future market growth. Table 5, with P value as 0.02, indicates that people with different income levels have different histories with and purchasing intentions toward solar PV system.

Participants were asked to note the locations where they had observed solar energy products. They chose the rooftops of residential buildings (83%), commercial buildings (36%), and government buildings (36%) as the most common places they had seen the solar power products. The results reported in Tables 4 and 5 suggest that participants may have observed solar water heaters on

the roofs of buildings.

According to Ansar (2013), consumers have been learning about climatic change and environmental issues through the mass media and advertisements. The most common media through which this study's participants have heard or seen news or advertisements about solar PV systems are television (70%) and the internet (49%). Participants believed that advertisements on television (60%) or advertisements from utility companies (50.7%) are the most reliable. Most participants knew that the government has provided incentives to improve the market for solar PV systems (77.1%) and held a positive attitude toward Chinese solar panel market trends (66.8%). However, 16.8% of participants were not certain about the outlook for the future SPS market.

In the third part of the survey, participants were asked to identify (a) factors that would positively influence their purchasing decisions, (b) barriers affecting the development of SPS markets, and (c) government incentives or policies they would prefer. In

**Table 2**

*Means of Public Opinion on Importance of Five Social Issues*

	Employment	Energy	Safety	Quality of Life	Education
Mean	3.01	2.44	3.37	3.61	3.08
P value	0.01*	0.02*	0.06	0.07	0.03*

**Table 3**

*Means of Public Opinion on Importance of Energy Subcategories*

	Pollution from Conventional Energy	Energy Shortages	Cost of Energy	Waste of Energy
Mean	2.80	2.50	2.39	2.40
P value	0.07	0.58	0.41	0.02*

order of importance, the participants listed the following reasons for them to adopt SPS: environmental protection, energy savings, government incentives, generating electricity and reducing electricity bills, public opinion, and recommendations from close friends or relatives (see Table 6). Participants considered the lack of suitable government support and high initial investment cost as two main barriers preventing the growth of the SPS market (see Table 7). Most of those choices appeared to be influenced by the varying needs of people from different income levels. In terms of government

incentives, participants most preferred that the central government would provide discounts on the purchase of Solar PV Systems (see Table 8). The results from this section indicated that cost saving is the major motivation for participants to consider the installation of SPS.

Table 6 shows significantly different levels of influence of family and friends' recommendations on the adoption of SPS in different income groups (p value of 0.036). Table 7 shows that participants from different income groups had significantly different

**Table 4**

*Knowledge of Solar Products (%)*

Product Name	I have used this	I have researched but not used this	I do not know what this is	P value
Solar water heater	75.70	19.15	3.27	0.69
Solar PV system	4.43	35.04	54.67	0.35
Solar power Battery	46.72	36.91	14.48	0.47

**Table 5**

*Purchasing History and Intentions (%)*

Product Name	I have purchased this	I plan to purchase this within 5 years	I do not plan to purchase this within 5 years	I do not know this product	P value
Solar water heater	48.59	25.23	21.02	2.3	0.47
Solar power battery	32.71	22.64	34.11	8.87	0.61
Solar PV system	5.60	17.28	39.71	34.11	0.02*

ideas about whether the size of their building structure would limit the required space for SPS (p value of 0.02).

### Implications and Conclusion

This research study indicates that solar PV systems have a bright future in the domestic market in China. Chinese citizens are

**Table 6**

*Reasons to Adopt SPS*

Reasons	Average score	P value
Environmental protection	4.58	0.27
Self-generated electricity to reduce expenses	3.97	0.08
Public opinion	3.69	0.23
Incentives and programs sponsored by government	4.19	0.055
An increased effort for sustainable energy production	4.26	0.64
Recommendations from family and friends	3.25	0.036*

**Table 7**

*Barriers Preventing the Growth of SPS*

Barriers	Yes (%)	No (%)	P value
Some people's attitude that clean and renewable energy is not needed and conventional energy is cheaper	16.8	83.1	0.30
The technology for solar power production is behind the technology possessed by other global markets	38.3	61.6	0.35
The building structure limits the required space for PV panels and solar power production	29.0	71.0	0.02*
There is not enough sunshine for solar power production due to weather and pollution	25.7	74.2	0.07
Local governmental policies do not support PV or solar power energy production	46.2	53.7	0.66
Initial investment costs are too high and the return on investment takes too long	40.6	59.3	0.06

Table 8

*Preferred Government Incentives*

Type of Government Incentives	Average score (scale of 1-5)	P value
Government offers cash discount on original investment (on purchase of PV panel by consumers)	1.93	0.63
Government offers discounted electricity rates for system owners with connectivity to the grid	2.44	0.38
Government provides low-interest loan to assist in initial investment costs	2.56	0.07
Restriction on companies' use of conventional fuel sources (e.g. 20% of electricity consumed must be from green sources)	2.96	0.47

the direct consumer group for SPS; understanding their concerns and preferences could largely improve the market and increase profits. This research focused on collecting and analyzing Chinese citizens' opinions, concerns, and attitudes about the adoption of SPS. The survey results indicated two major barriers to the adoption of SPS: high initial cost and lack of knowledge of SPS.

To address cost concerns,

- Low-interest loans could improve the adoption of SPS. Even with preferable loan policies, solar energy may not be cost competitive with conventional electricity, but loans could reduce the pressure of the initial investment. If there is not sufficient financial support for the adoption of SPS, it will not be a high priority, since most customers care most about their electricity bill (Rundle, Paladino, & Apostoal, 2008).
- Limiting the electrical output of fossil fuel and increasing the cost of conventional energy could make SPS more competitive

with the current strong conventional energy industries.

To promote consumer education:

- Increase public awareness of environmental values and ecological lifestyles in order to motivate the public to seek and try green products such as SPS.
- Augment consumer knowledge of solar PV systems. Rowlands and Parker (2002) found that perception of a renewable electricity source determined the premium that a green consumer was willing to pay.
- Place trustworthy environmental advertisements on television and the internet. Akehurst, Afonso, and Goncalves (2012) explained that environmental advertisements are an effective way to educate consumers about green products and to help them make informed decisions. According to Chen & Chang (2012), building trust with customers enhanced their intentions to buy green products.

The results of this study could help government policymakers and industry leaders plan and implement strategies to encourage more customers to participate in SPS installation. However, as a pilot study in this field, our findings can be potentially extended to research on the adoption of other new technologies.

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# Purchasing Efficiency Measurement of Selected Electric Vehicles in the United States Utilizing Data Envelopment Analysis (DEA)

JONATHAN SVOBODA AND DEREK LAGASSE

## Abstract

Consumers today face an ever-increasing number of choices when deciding what purchases to make. Nowhere is this more apparent than the market for vehicles. Many factors affect a consumer's ultimate decision of what vehicle to purchase or lease. Further, electric vehicles present the consumer with additional unique considerations. This study evaluates the decision making process used by consumers in purchasing an electric vehicle. The decision making units (DMUs) used in this research include manufacturer's suggested retail price (MSRP), range in miles, miles per gallon equivalent (MPGe), cargo space in cubic feet, and charge time in hours. These variables are factors commonly of interest to consumers. Further, Data Envelopment Analysis (DEA) has been applied to determine the relative efficiencies of twelve consumer electric vehicles currently on the market; eight electric vehicles were

found to be efficient choices and four were found to be inefficient. Included in this study are suggestions on how auto manufacturers can improve the efficiency of vehicles deemed inefficient.

## Introduction

An electric vehicle (EV) is a form of alternative energy transportation. It is "alternative" in the sense that it is not powered by gasoline, the standard fuel source for most modern consumer vehicles. Compared to their gasoline counterparts, EVs trade gas tanks for battery packs and internal combustion engines for electric motors. They may seem like a modern concept, but their history reaches back nearly to the dawn of automobiles. In the early days of loud, cumbersome, and unreliable internal combustion engines, people looked to the electric car to revolutionize transportation. Thomas Davenport built the first electric vehicle (EV) in 1834. From that time, technological advances have led EVs to outpace gasoline powered vehicle sales: EVs held a 38% market share in 1900 compared to 22% for the gas powered vehicle; steam powered vehicles account for the remaining 40%. Due to lack of battery technology, the electric car lost traction and gasoline became the preferred fuel source. More EV research was done in the 1960's as a result of the space program. A recently developed class of vehicles combines the benefits of both power sources to achieve short refueling times, long driving range, and high fuel efficiency. This combination has led hybrid-electric vehicles, or "hybrids," to outsell "pure" EVs (Lerner & Lerner, 2008). However, improved battery technology has also driven a resurgence of "pure" EVs. Sales of street legal EVs were fueled by improvements in technology and incentives between 2008 and 2015; 373,000 have been sold in the United States, accounting for 38% of the "plug-in" electric vehicle fleet worldwide (Cobb, 2015). According to Electric Drive Transportation Association's statistics, the total electric market share of cars (including hybrids, plug-in hybrids, extended range and battery) sold in the United States ranged from 2.23% to 3.47% from 2007-2016. There are several benefits to purchasing an EV. First, the design of EVs allows for little or no energy use when coasting.

Also, instant torque is available to the driver. Taking into account the need to create electricity to charge them, EVs are still considered more efficient than their gas counterparts (Lerner & Lerner, 2008). However, other factors to take into consideration are that, in general, electric vehicles have less range than gasoline-powered cars, are more expensive than their gasoline-powered equivalents and require expensive charging stations and/or extended periods of time to recharge. As electric vehicles make a comeback, there is a need to evaluate market offerings in this expanding industry. The efficiency of various EVs on the market should be studied to increase adoption of alternative energy transportation, to remain competitive against other means of transport, and to better inform consumers.

The goal of this study is to evaluate plug-in electric vehicles currently on the market in the United States as of 2015, and to determine which one(s) produce(s) the highest DEA efficiency. DEA analysis is an ideal tool for consumers since it measures how efficient a purchase is. Efficiency in this context is defined as how efficiently the consumer's dollars (inputs) are converted into performance and utility metrics (outputs).

A number of variables are of concern to the average automobile consumer. The major input for consumer's purchasing an EV is the purchase price, for which the standard measure is the manufacturer's suggested retail price (MSRP) of the vehicle. Outputs are the vehicle's range, miles per gallon equivalent (MPGe), cargo space in cubic feet, and charging time in hours. Given these variables, DEA analysis determines how efficient the purchase of a given electric vehicle is in relation to other vehicles available. Analyzing this market shows which vehicles efficiently deliver value to the consumer and how inefficient vehicles can improve their standing. These measures of efficiency provide advice to manufacturers for product improvement and consequentially increase the adoption of alternative energy vehicles.

The paper includes a review of the literature relevant to this study. A brief discussion of DEA modeling and preliminary analysis of data is provided. The final results and discussions are demonstrated utilizing the DEA model.

## Literature Review

A review of published literature found that efficiency of the available options when purchasing an electric car has not been thoroughly studied. A small selection of studies uses the DEA model to compare automobile efficiency. Of the two published works found, only one source evaluated alternative energy vehicles. The Uppsala University Department of Economics performed a study of vehicle efficiency using DEA analysis in 1997. This study, conducted by Papahristodoulou (1997), focused on 121 European Fossil Fueled vehicles with statistics from a German automotive magazine. The study grouped the vehicles into three categories based on engine volume and evaluated the efficiency of each vehicle relative to others in the same group. Input and output variables selected for evaluation included MSRP, cost of ownership (including fuel and insurance), total interior volume, cargo area volume, engine horsepower, acceleration time (0-60 mph), depreciation after one year or ownership, top speed, and wheelbase length. Much can be learned from the structure of the DEA analysis employed. However, the vehicles from this 1997 comparison are now outdated.

Partovi & Kim (2013) utilized DEA analysis to compare vehicles in five categories in order to find the most efficient vehicle relative to fuel efficiency and carbon emissions. The five categories of vehicles were based on the type of fuel the vehicles consumed. Categories were diesel, gas, hybrid gas/electric, fully electric, and hydrogen vehicles. Inputs for DEA analysis included the annualized MSRP, fuel cost, and maintenance cost. Outputs were carbon footprint, range (based on MPG/fuel tank size), horsepower, acceleration time, and cargo volume. Although this study does include electric vehicles, many options were either not available for purchase in 2013 or excluded from study. Only four electric vehicles were compared and some data may no longer be accurate. Also, one of the four vehicles compared was the Chevrolet Volt, which is equipped with a gasoline-powered generator to extend the range of the vehicle; this presents difficulty in comparing it with fully electric peers.

Numerous studies on electric vehicles identify several

key consumer preferences. When deciding whether to purchase an electric vehicle or gas-powered vehicle, consumers valued certain characteristics. Usage patterns indicate that 70% of all travel personal automotive travel never exceeds 100 miles of driving per day. Thereafter, trips beyond 100 miles in one day are statistically infrequent (Tamor, Gearhart & Soto, 2013). A separate study confirms this finding by data collected from 484 instrument equipped vehicles. The study also indicated that automobile consumers have a poor understanding of fuel and range of electric vehicles and their own usage habits. As a result, potential consumers have “Range Anxiety” “when selecting an electric vehicle; this is based on the fear of running out of charge when driving (Pearre, Kempton, Guensler, & Elango, 2011). Therefore, from consumers’ perspectives, the most important feature of an EV is that it is range sufficient and can meet or exceed their daily mileage needs.

Consumer studies indicate concerns with the charging time of electric vehicles. Research into consumer preferences indicates that customers demand faster charge times. This preference results from a consumer who is used to gasoline vehicles comparing EV charging with filling up at a gas station (Pearre, Kempton, Guensler, & Elango, 2011). Although such studies indicate consumers prefer a faster charging time, operational statistics indicate the opposite. When patterns of EV usage and charging were tracked, studies found that a majority of vehicle charging takes place during the workday or at night, as the consumer sleeps (Speidel & Bräunl, 2014). As long as a vehicle can fully charge in 6-8 hours, it can be deemed operationally “efficient” despite consumer beliefs. In practical applications, electric vehicles would not require the use of charging stations away from home/work, unless traveling beyond the vehicle’s range. Such trips are found to only occur on rare occasions, and the target market in the United States for electric vehicle adoption is a two-car household with a gas-powered vehicle available for such long trips (Tamor & Milacic, 2015). For commercial applications as fleet vehicles, the same logic applies; charging would likely occur during non-work hours when vehicles sit idle for long periods of time, and “fast charging” is not operationally necessary.

## DEA Model

Data Envelopment Analysis (DEA) is a useful tool to compare a uniform set of entities. The DEA model was first applied by Michael Farrell in 1957, then further popularized and named by Abram Charnes, William W. Cooper and Eduardo Rhodes in the late 1970’s (Darity, 2008). This model is extremely useful to estimate efficiency when multiple inputs are used to produce various outputs, since it can operate independent of scale or specific variables. The DEA model analyzes the relative performance of Decision Making Units (DMUs). DEA can still model efficiency in absence of specific distributions or inputs; this allows the DEA model to be applicable to a wide variety of situations. For the study presented here, the DEA model is able to be applied by treating each electric vehicle as an individual Decision Making Unit. This research could be further extended to any variety of vehicle performance inputs and outputs relevant to consumer decision making.

The efficiency ratios in the DEA model are an advanced version of a multifactor productivity ratio. The DEA formula compares the productive efficiency of each particular unit relative to other DMU’s. DEA analysis has numerous advantages that aide in analyzing the collected data. The DEA model allows for the comparison of multiple inputs and outputs on independent scales; this process reveals relationships between entities that remain hidden when utilizing other statistical methods. Units are assigned an efficiency percentage allowing us to identify inefficient units. Units that achieve a score of 1.00 or 100% are efficient, and units scoring less than 1.00 or 100% are inefficient. Results from DEA analysis also allow us to identify sources of inefficiency in each decision-making unit and corrections that can be made to remedy the inefficiency. The objective function of the DEA model is set up to maximize efficiency “Ee” for the given decision making unit. The variable “u” represents the output of each DMU. The variable “v” represents input of each DMU. Variables “O” and “I” represent the weights of the respective inputs and outputs. Variable “M” expresses the total number of outputs being compared and Variable “N” represents the total number of inputs being compared. This notation demonstrates

that the objective function can be extended to different quantities of input and output categories subject to the needs of analysis.

*Objective Function:*

To solve the objective function using a linear programming model, the original objective function must be translated into a linear function. When expressed in a linear form, it is possible to use Linear Program Solver tools such as Microsoft Excel Solver to obtain a solution. Using the solver to change the weights expressed

$$(MAX) E_e = \frac{u_1 O_{1e} + u_2 O_{2e} + \dots + u_M O_{Me}}{v_1 I_{1e} + v_2 I_{2e} + \dots + v_N I_{Ne}}$$

as “O” and “I” obtains the optimal solution for each DMU. This transformation results in the numerator of the objective function expressed as a linear equation to be maximized, and the denominator becoming a constraint where it sets up to equal to 1. Therefore, the linear expression of the objective function would be:

Another set of constraints ensures that the efficiency of all the decision-making units will not be greater than 1. Variable “k” represents the index of decision making units being evaluated. Capital “K” represents the last DMU. The original format of the constraint is the ratio of the weighted output over weighted input

$$(MAX) E_e = u_1 O_{1e} + u_2 O_{2e} + \dots + u_M O_{Me}$$

$$(S.T.) v_1 I_{1e} + v_2 I_{2e} + \dots + v_N I_{Ne} = 1$$

with a nonlinear format, which is needed to transform into a linear format just like the objective function.

*Constraint Function:*

The equivalent linear equation would say that the difference between the weighted output and the weighted input should be less than 0, which:

To ensure the optimal results, the DEA model also requires that the quantity of DMU’s exceeds two times the total number of

inputs and outputs being evaluated. This constraint expresses the

$$\frac{u_1 O_{1k} + u_2 O_{2k} + \dots + u_M O_{Mk}}{v_1 I_{1k} + v_2 I_{2k} + \dots + v_N I_{Nk}} \leq 1 \quad k=1,2,3,\dots,K$$

minimum quantity of DMU’s to be selected given the number of inputs and outputs being evaluated.

$$(u_1 O_{1k} + u_2 O_{2k} + \dots + u_M O_{Mk}) - (v_1 I_{1k} + v_2 I_{2k} + \dots + v_N I_{Nk}) \leq 0 \quad k=1,2,3,\dots,K$$

Sample (DMU) Quantity Constraint:  $K \geq 2(N+M)$

**Data and Preliminary Data Analysis**

Variables were chosen based on the previous studies by Papahristodoulou (1997), Partovi & Kim (2013), and other studies relating to the purchasing of vehicles and consumer demands specific to electric vehicles. Here are the major inputs and outputs.

**Price:** The most direct input when purchasing a vehicle is its price. While what consumers actually pay varies, based on incentives and their negotiating skills, Manufacturer Suggested Retail Price (MSRP) is the standard base measure of a vehicle’s price.

When buying a vehicle, consumers have numerous feature considerations to make, which are the output variables of such a purchase.

**Cargo Space:** It is a common decision variable. Usually it is the storage capacity of the vehicle, measured in cubic feet, which does not impede on passenger volume.

**Fuel efficiency:** An important measure for most buyers, EVs measure this metric in MPGe. As stated by Green Car Reports, “(MPGe) stands for “miles per gallon (of gasoline) equivalent. Those MPGe figures have mystified many potential plug-in electric car buyers, but they remain the primary way of comparing energy efficiency by internal-combustion and electrified vehicles” (Edelstein, 2015). It is calculated as follows: The Environmental Protection Agency (EPA)

determined that 1 gallon of gasoline contains 33.7 kilowatt hours of electricity (kWh). MPGe is based on the kWh the vehicle uses to drive 100 miles. The Volkswagen e-Golf for example, uses 29 kWh/100 miles. The calculation is: 100 miles / (29kWh/33.7kWh) = 116 MPGe (fuelconomy.gov). MPGe is a commonly used way of measuring vehicle efficiency, which is correlated with charging costs. Generally, the higher the MPGe, the less the vehicle will cost to charge.

**Range:** Measured in miles, it is how far the vehicle can go before running out of charge. It is a result of efficiency and battery size.

**Charge Time:** Reflective of how long it takes to charge the vehicle using a 240V socket, the highest voltage outlet commonly available. Consumers generally prefer a lower charge time. As such, charge time has been treated as an input variable. Some EVs possess a “quick-charge” feature, which allows the vehicle to be charged to 80% capacity in approximately 30 minutes. This research considers charge time as the time necessary to charge the vehicle from “empty” to maximum battery capacity.

Given multiple dimensions and complexity of comparing

so many EVs, making such an expensive purchasing decision is often daunting. Data was collected from online sources. Multiple websites were used, including manufacturer sites (Ford.com, Kia.com, etc.), automotive publications, namely Car and Driver and the U.S. Government’s site, FuelEconomy.Gov. It was also attempted that data for each variable was collected from a single source to ensure consistency. Data was cross-checked with other sources to ensure accuracy.

### Results

This study utilizes DEA analysis to measure the efficiencies of twelve electric cars available in the United States. Microsoft Excel with a solver add-on has been used for computations. The range of possible efficiencies is between 0 and 1.00. If a vehicle’s efficiency was measured to be 1.00, then the vehicle is said to be efficient. If efficiency is found to be less than 1.00, the vehicle is said to be inefficient. Eight electric vehicles were found to be efficient, and four were found to be inefficient. The results are shown in Table 2.

### Recommendations

Computations from the Excel solver include a shadow price for each decision making unit analyzed. The shadow

Table 1

<b>Decision Variables</b>	
<b>Inputs</b>	<b>Outputs</b>
Manufacturer’s Suggested Retail Price (MSRP)	Range (Miles)
Charge Time (Hours)	Miles Per Gallon Equivalent (MPGe)
	Cargo Space (Ft <sup>3</sup> )

price measures how inefficient decision making units could become efficient, with reference to efficient decision making units. Using the shadow price enables computation to find what variables have to change, and by how much, for an inefficient vehicle to become efficient. Please refer to Table 3 to see the recommended changes. Recommendations are as follows:

The Fiat 500 EV is inefficient due to its cargo space, an output and price, and charge time inputs. Cargo space should be increased from 7 to 17.91 cubic feet of cargo space; this would require more than doubling the Fiat's cargo capacity. MSRP should be reduced from \$31,800 to \$30,544.19, and charge time should be reduced from 4 to 3.84 hours. These changes would

**Decision Variables Table**

Table 1

		Output 1	Output 2	Output 3	Input 1	Input 2
Make/Model	DMU #	Range (Miles)	MPGe	Cargo Space (Ft <sup>3</sup> )	MSRP	Charge Time (Hours)
Tesla Model S-85	1	265	89	26	\$80,000	12
Nissan Leaf S	2	84	114	24	\$29,010	8
Nissan Leaf SE	3	84	114	24	\$32,100	5
Fiat 500EV	4	87	116	7	\$31,800	4
Chevy Spark EV	5	82	119	11	\$25,170	7
Ford Focus Electric	6	76	105	14	\$30,045	3.6
Kia Soul EV	7	93	105	19	\$31,950	4
BMW i3	8	81	124	15	\$43,350	4
Mercedes B-Class	9	87	84	22	\$41,450	3.5
Volkswagen e-Golf	10	83	116	17	\$28,995	3.7
Smart Four-Two EV	11	68	107	8	\$25,000	6
Mitsubishi i-MiEv	12	62	112	13	\$22,995	7

increase the Fiat's efficiency rating from 0.9605 to 1.00.

The Ford Focus Electric is inefficient because of its cargo space, MSRP, and charge time as well. The Focus' cargo space should be increased from 14 to 15.70 cubic feet. The vehicle's MSRP should drop from \$30,045 to \$26,907.59. Charge time should be reduced from 3.6 hours to 3.38 hours. Following these suggestions would

increase the Focus' efficiency rating from 0.9377 to 1.00.

The BMW i3 is inefficient due to its range and cargo space, outputs and MSRP, and charge time inputs. The i3's range should be increased from 81 to 88.72 miles and cargo space should be increased from 15 to 18.1724 cubic feet. Also, it is recommended that MSRP be reduced from \$43,350.00 to \$30,994.66, and charge time should be dropped from 4 hours to 3.96 hours, (an almost insignificant sum). Implementing these changes would increase the i3's efficiency rating from 0.9888 to 1.00.

The last inefficient vehicle is the Smart For-Two EV. It is inefficient because of its cargo space, MSRP, and charge time. The Smart's cargo space should be increased from 8 to 12.70 cubic feet. It is recommended that MSRP be reduced from \$25,000.00 to \$23,514.76, and charge time should drop from 6 to 5.64 hours. Implementing these suggestions would increase the Smart's efficiency rating from 0.9406 to 1.00.

### Conclusion

In this study, DEA analysis was used to determine the efficiencies of twelve electric vehicles. Of the twelve vehicles studied, eight are efficient choices, while four are inefficient. This study allows consumers to readily compare their options when buying an electric vehicle. Results of this study will enable consumers to make an efficient purchasing decision with priority to their specific needs. Manufacturers can also benefit from this study; by making the recommended changes to their vehicles, manufacturers can increase their competitiveness relative to other offerings.

The limitations of this study involve

## Recommendations to increase efficiency

Table 1

Make/Model	Efficiency Score	Conclusion
Tesla Model S-85	1	efficient
Nissan Leaf S	1	efficient
Nissan Leaf SE	1	efficient
Fiat 500EV	0.9605	inefficient
Chevy Spark EV	1	efficient
Ford Focus Electric	0.9377	inefficient
Kia Soul EV	1	efficient
BMW i3	0.9888	inefficient
Mercedes B-Class	1	efficient
Volkswagen e-Golf	1	efficient
Smart Four-Two EV	0.9406	inefficient
Mitsubishi i-MiEv	1	efficient



Table 1

Make/Model	Range (Miles)	MPGe	Cargo Space	MSRP	Charge Time
Fiat 500 EV	87	116	17.91	\$30,544.19	3.84
Ford Focus Electric	76	105	15.70	\$26,907.59	3.38
BMW i3	88.72	124	18.17	\$30,994.66	3.96
Smart For-Two EV	68	107	12.70	\$23,514.76	5.64

meeting specific consumer's needs. If the consumer's usage pattern of the vehicle involves overnight charging and never exceeds the vehicle range in a single day of driving, charge time may be less critical. Some consumers may live in urban environments where space commands a premium. Therefore, buyers may prefer smaller vehicles such as the Fiat 500 EV, BMW i3, or the Smart For-Two EV. Since the automotive purchasing environment in the United States involves negotiation, it is possible for urban consumers to bargain for the efficient price listed in Table 3.

Further, the Tesla Model S, Mercedes B-Class, and BMW i3 are classified as luxury or near-luxury vehicles. Some of their features were not quantifiable for the purpose of this study. Due to their added amenities and comforts, some consumers may consider them more efficient when compared to non-luxury vehicles. Despite the fact that luxury amenities were not quantified, the Tesla Model S and Mercedes B-Class were deemed efficient relative to all EV's available. Therefore, if either the Tesla or Mercedes is within the consumer's budget, it would be a more efficient purchase than a BMW i3 in the luxury category.

Other factors that may be valuable to some consumers were not included in this current study. Acceleration, measured by 0-60 mph time in seconds, is a common metric of vehicle performance;

this was not included, as the purpose of this study was to evaluate utility and practicality rather than performance. Long-term maintenance costs were not included due to limited data availability. Further studies would need to be designed to include these measures.

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# Torment of the Repressed: Race and the Gothic in Hannah Crafts' and Charles Chesnutt's Fiction

SHARRISSE VILTUS

Gothic literature is a literary genre that combines elements of horror and death within fiction originating from eighteenth-century Europe. However, it also serves the purpose of capturing society's abuse against the weak. As explained in Jerrold E. Hogle and Andrew Smith's "Revisiting the Gothic and Theory," "...The Gothic comes alive (like Frankenstein's creature) as an important, multi-layered, and profoundly symbolic scheme for dealing with Western culture's most fundamental fears and concerns" (1). In other words, the genre can be used to its full potential if it confronts a society's underlying fears, including the treatment of the marginalized. The Gothic genre possess distinct characteristics that help underscore that confrontation, including an ominous setting which reflects a broken, decaying landscape—representing the deconstruction of societal idealism—and a recurring villain that epitomize the "evil" of the narrative. The characteristics also extend to supernatural oddities such as restless spirits, hauntings, and transformations that serve as external conflicts for characters to either succumb to or overcome.

Gothic fiction, therefore, has a unique place within African-American literature of: recovering lost agency, characters fighting to survive, antagonists transforming into an evil entity, and society doing its best to repress the horror of its sin. The fiction

of Hannah Crafts and Charles Chesnutt demonstrate that, with the right strategies, the Gothic genre can serve as a perfect device for black authors to confront the system of slavery and the extent it has subjugated the humanity of the black marginalized. In doing so, they also uncover the nightmarish memory of terror, cruelty, and death passed down the generations. Crafts' novel follows the first-person narrative of protagonist Hannah, a biracial slave, when her life changes after her master's engagement to a beautiful, unnamed woman—who becomes the household's new mistress. She confides her own African heritage to Hannah on the night of the engagement after a malicious lawyer, who makes a fortune uncovering terrible secrets from wealthy families, threatens to expose her secret to her fiancé. The mistress, in a moment of passion and unable to bare subjection, urges Hannah to escape with her. Thus, the story commits itself to the themes of perseverance while Hannah and the mistress flee across the wilderness. Crafts' employment of Gothic strategies is hinged on the eerie physical environment of the South, apparitions that inflict terror on slaves, and the reoccurring antagonists in the form of slaver owners. The original, handwritten manuscript of the novel remained unchanged for its 2002 publication, including the author's strikethroughs of deleted sentences and passages. "The Goophered Grape" from Chesnutt's short story collection, *The Conjure Woman*, uses the frame narrative to return the audience back to the antebellum era in order to convey tales of how blackness was treated for a post-bellum audience. In the short story, a black southerner and former slave named Uncle Julius McAdoo recalls the gruesome transformations of a cursed slave to white northerners John and Annie, who both wish to purchase an abandoned property. However, in "The Dumb Witness" the story-telling role transitions to John, who tells the tale of a speechless freed slave woman named Viney in the ruined Murchison Mansion. All three works demonstrate the various ways to utilize Gothic fiction's influence. Crafts' recently discovered novel, *The Bondwoman's Narrative* (2002), uses the Gothic genre to expose the horror of dehumanization faced by black slaves in antebellum America; whereas Chesnutt's short stories, "The Goophered Grapevine" (1899) and "The Dumb Witness" (1899)

reveal how the genre can also revive the pain of the forgotten for post-bellum multiracial audiences.

Crafts and Chesnutt use the Gothic genre to unify the racial interests of black and white audiences to convey universal themes of horror in the antebellum and post-bellum eras. In his 1928 article, "The Dilemma of the Negro Author," James Weldon Johnson presents a theoretical argument on the way black authors such as Crafts and Chesnutt should approach their craft and deliberately choose an audience: "Instead of black America and white America as separate or alternating audiences...there needs to be a fusion." Johnson goes on to conclude that success ultimately relies on: "...something that rises above race, and reach[es] out to the universal in truth and beauty" (382). To apply Johnson's theory to Crafts and Chesnutt, both authors balance the interests of white and black readers to sell the story of human triumph and the infliction of horror that was committed against black characters. The *Bondswoman's Narrative* fuses the literary genres of the slave narrative and Gothic fiction, making the novel, more than a century later, a success by combining fictitious supernatural elements with the reality of slavery. However, in the post-bellum era, "The Goophered Grapevine" and "The Dumb Witness" exemplify Johnson's theory more than *The Bondswoman's Narrative* through transitioning narrative perspectives. From Uncle Julius' narration in "The Goophered Grapevine," the audience witnesses the legacy of slavery through the eyes of a black character. However, Chesnutt alternates to John's perspective in "The Dumb Witness" to allow accessibility for a white audience. By allowing two racially distinct characters to reflect on tales of antebellum suffering, Chesnutt gives his works more opportunities for a diverse audience to understand his message.

The Gothic genre is effectively used in *The Bondswoman's Narrative* to introduce the audience to the fear of being denied humanity in the antebellum period. Crafts creates an atmosphere of surreal, beautiful scenery that contains a hidden, decaying element—a strategy of Gothic literature that constructs an eerie reflection of slaves' dehumanization. At the climax of the novel, Hannah is sold to her final owners before her escape the South for good. She

is unfairly punished for allegedly gossiping about her new mistress, Mrs. Wheeler, and is forced to work as a field slave despite her lack of experience. The act is a cruel moment of devaluation for Hannah and only progresses as an overseer turns her into a sexual object for others to own. He offers another slave, Bill, to have possession of her without her consent: "You seem interested in Hannah...Take her to your cabin" (214). Hannah has no choice but to comply after long, grueling work and expects the worst as she accompanies him to the "cabin" only meant for field slaves. As Hannah moves from the Wheelers' main estate to the slaves' domain, there is a Gothic approach to introducing the state of black slaves' humanity: "They said that many of these huts were old and ruinous with decay, that occasionally a crash, and a crowd of dust would be perceived among them... head and limbs are so plentiful that they seem of small account" (205). The scene is a depiction of the slave huts, yet it is coalesced with the description of the field slaves' condition. Inanimate objects are treated in the same tone of disgust as the people while Hannah observes the ugly characteristics of the otherwise beautiful Wheeler plantation. The scene is portraying the state of the society in the antebellum era: lush, eye-pleasing beauty on the surface, but nurturing an ugly mistreatment of human beings underneath. Hannah then witnesses the atrocities that strip people of their humanity by observing Mr. Wheeler's slaves' conditions inside the huts; she notes that the slaves were, "...scarcely conscious that any link exists between themselves and other portions of the human race. Their mental condition is briefly summed up in a phrase that they know nothing, care for nothing, and hope for nothing" (206). Hannah is surmising the condition of the field slaves in her owner's land—they are in no condition to care about themselves beyond the necessity to survive, resulting in their destitute state. She strikes-through "care for nothing, and hope for nothing" as if aware that she is dehumanizing the field slaves as well, drawing a line between depicting cruelty and being cruel herself. Members of the black and white audience are to feel horror that black slaves were reduced to animals from the lack of attentiveness to their basic human needs.

The antebellum period use of Gothic genre utilizes the

characteristics of the supernatural in the struggle for black slaves to gain agency over their bodies and fates in *The Bondwoman's Narrative*. Hannah's environment heavily relies on elements of the supernatural to impede her escape from bondage, representing society's unwillingness to allow black Americans control over their fates. The background becomes dark and terrifying when she and her mistress run away from the Lindendale mansion: "Trees in the dusky gloom took the forms of men, and stumps and hillocks were strangely transferred into blood-hounds crouching to spring on their prey" (53). Hannah is unable to differentiate reality from her own imagination, a repetitious technique used by the text to fuse supernatural elements with the novel's reality. However, the supernatural also plays a crucial role in aiding Hannah's mistress. The mistress, who discovers she is of African descent, attempts to escape with Hannah rather than be confronted by her husband, and both are eventually caught by Mr. Trappe, the narrative's ominous antagonist. After her mental degradation and facing the inevitable outcome of spending the rest of her life in bondage, the mistress takes matters into her own hands through unseen circumstances: "He was interrupted by a slight scream from his victim...A gleam of satisfaction shone over her face. There was a gasp, a struggle, a slight shiver of the limbs and she was free" (103). Through her own willingness to die, the mistress briefly takes control of her agency and frees herself before Mr. Trappe could have the satisfaction of selling her. Blood is heavily described in the scene of her death, and Hannah can barely comprehend it, but can see that the mistress has achieved freedom. There is no explanation of her sudden demise: however, Gothic conventions can be observed in the nature of the scene with a tragic undertone. It reveals to Hannah one certain way of attaining true freedom from a life of cruelty—through death.

The antebellum period use of Gothic genre gives the black repressed a voice to demonstrate pain through hauntings and tales in *The Bondwoman's Narrative*. In the tradition of African American slave narratives, Crafts' novel also exhibits the suppression of trauma of black slaves while the narrative articulates how the system of the country reinforces the silent degradation. The Gothic genre is used

in *The Bondwoman's Narrative* in giving the silenced a way to voice the pain of their dehumanization—as curses and oral tales. Hannah's first place of work as a house slave is where the audience first encounters a black slave's pain in the text: the Lindendale mansion. The mansion houses the curse of the Linden tree, a tale rooted in a history of blood and violence of black bodies. The original mansion owner, Sir Clifford, is remembered for his cruelty to his slaves and how he tortured an old slave woman and her dog, both of whom died on the Linden tree. The slaves recall the tale with apprehension: "Such was the legend of the Linden as we had heard it told in the dim duskiess of the summer twilight or by the roaring fires of wintry nights...an unusual degree of interest was attached to the tree and the creaking of its branches filled our bosoms with supernatural dread" (25). The tale is far older than any slave alive in the narrative and yet is told and passed down the generation, granting the old woman a voice when she wasn't allowed to have one while living. The woman's pain becomes a "curse" as expressed in her last words to Sir Clifford: "I will hang here till I die as a curse to this house, and I will come here after I am dead to prove its bane" (25). In "The Strange Ideas of Right and Justice: Prison, Slavery and Other Horrors in *The Bondwoman's Narrative*," Jason Haslam asserts that the tree extends to more than just a Gothic strategy in the narrative: "...the roots of the family tree...are supported by the 'human blood' of slaves, and that ideal can therefore be threatened by the possibility of a slave's voice being raised in the narrative rebellion, outside the bounds of the master's control" (34). Haslam is arguing that the voice of a slave—and that voice being heard—is a violation of the system itself. With the old woman's last words heard and her story remembered, the Gothic narrative serves its purpose of demonstrating the pain of the repressed.

In the post-bellum period, the Gothic genre is employed to remember the torment of black slaves in Chesnut's "The Goophered Grapevine" and "The Dumb Witness." In comparison to the antebellum use of Gothic conventions by Crafts, Chesnut demonstrates to the audience that the post-bellum period Gothic genre can focus on resurfacing the legacy of the antebellum oppression.

Chesnutt implements Gothic strategies to criticize the system that continued to subjugate black Americans for a contemporary black and white audience. In his pursuit, he uses the African American conjure tale tradition—tales that contains folk magic passed down the generations of black families. “The Goophered Grapevine” follows narrator, John, and his wife, Annie, as they search for their new prospective home in North Carolina when they meet Uncle Julius. The property, as it is later revealed, previously belonged to Uncle Julius’ former master McAdoo. In the short story, John represents the audience, as an outsider looking in and listening to strange stories of magic and curses. The reader’s suspicion of Uncle Julius’ antebellum stories is reflected in John’s character by his lack of sympathy in comparison to Annie, noting how the former black slave benefits from telling the tales. Regardless of what Uncle Julius gains at the end, Chesnutt fuses the conjure elements that reflect the Gothic genre conventions and African-American subculture of folklore to remember the body horror common within the slave system. “The Goophered Grapevine” narrates, through Uncle Julius’ reminiscence, the story of an unfortunate slave who is cursed by a grapevine and how his suffering is used as a commodity by his master. “The Dumb Witness,” transitions the story-telling role to John, who discloses the tale of a speechless freed slave woman named Viney in the ruins of a mansion. The short story uses the frame narrative device to convey how a black female slave’s voice is lost and recovered with Gothic strategies of historical revival—that is, for repressed black slaves to be remembered and not forgotten in time. While there are varied applications of supernatural strategies, “The Goophered Grapevine” and “The Dumb Witness” are ultimately directed for post-bellum black and white audiences to critically gaze at the suffering of the oppressed.

In using Gothic conventions, Chesnutt revives the legacy of the repressed by revealing how black personhood was used as a commodity in “The Goophered Grapevine.” In the short story, Uncle Julius relates to John and Annie the tragedy that befell a slave at the vineyard the couple wishes to purchase. Gothic strategies are presented to describe the state of the old vineyard, “...partly

supported by decayed and broken down trellises...and the few scattered grapes they bore were the undisputed prey of the first comer” (6), in order to give the setting a dreary and haunting mood for the couple. Uncle Julius, representing the antebellum perspective, is the audience’s bridge to the slave narrative where black bodies were treated with horror: of how a conjure woman “goophered”—or cast a spell—on the luscious grapevine at the behest of the master when it was discovered that slaves are stealing grapes. Misfortunate falls on a recently purchased slave, Henry, when he eats from the goophered grapes and his life becomes linked to the vineyard. The tale is one of grisly bodily horror when Master McAdoo takes advantage of Henry’s curse and makes a profit from his suffering—by selling Henry to slave buyers while he is strong, knowing that the slave would later be returned feeble and weak and be nursed back to health to recycle the process. The slave’s life is nothing more than a commodity, and it only ends after a northerner gave McAdoo the wrong agricultural advice and causes the grapevine to die, along with the cursed Henry. Although Chesnutt utilizes supernatural conventions, such as a physical human link to nature in the frame narrative, he forces the audience to understand the terror of how avarice and power can dehumanize the black repressed. In Hyejin Kim’s analysis of the Gothic storytelling in *The Conjure Woman*, he asserts the importance of “The Goophered Grapevine:” “... Julius’s transformation tales conjure up the return of the socially repressed elements that were once abjected and Gothicized under slavery, thereby reconstituting a point of view that draws attention to the same danger of racial hegemony in post-bellum America” (415). In other words, Chesnutt is using Gothic strategies to criticize the thoughtless way black bodies were commoditized during slavery and how they are remembered in the post-bellum era.

Chesnutt’s post-bellum short stories use the Gothic genre to refuse to permit the suffering of the black repressed past to be forgotten. In “The Dumb Witness,” Chesnutt has the opportunity to remember a voice of the repressed from a post-bellum perspective in contrast to an antebellum view point. John, rejecting the validity of Uncle Julius’s perspective, interprets the story of the Murchison

Mansion where the aging Malcolm Murchison resides with his former slave, the elderly Viney. The pair live in tense discord and are mentally tied to the past when the property was once beautiful and economically flourishing before the Civil War and not the dwindling mansion John observes. Chesnutt employs Gothic strategies in showing the decay of what used to be a prosperous property: "... a few collards and okra-plants and tomato-vines struggled desperately against neglect and drought and poverty of soil" (757). The decay John observes epitomizes post-bellum deterioration of the South, suggesting society's values are rotten due to past treatment of the repressed. In John's frame narrative of the Murchison story, Malcolm mutilates Viney in rage and robs her ability to speak, leaving her without the agency she once had at the start of the tale. Viney's loss of her voice is similar to Rose's torture in *The Bondwoman's Narrative*, where she temporarily loses her ability to speak until she bares her curse. However, unlike Rose, Viney's pain is forgotten by those close to the Murchison Mansion as well as all the other slaves who move on after the war; only Uncle Julius and Malcolm are present to remember what was done to her. The condition of the landscape makes the act even more unsettling: the prosperous land begins to wane as Malcolm tries to cajole the whereabouts of documents from her that could give him permanent ownership of the estate. The voice of a slave in this context is, ironically, of value—Chesnutt gives Viney the ultimate ownership of her master's future just as Malcolm has always had over hers. She stays by his side as a "dumb" witness to his psychological breakdown—which John describes as: "...some gruesome attraction in the scene of her suffering" (767)—until finally Malcolm dies after John concludes the tale. To John's astonishment, Viney can speak shortly after Malcolm's death: "Her articulation was not distinct, but her words were intelligible. I was never more surprised in my life" (768). There is no application of the supernatural in John's tale; instead, Chesnutt uses with Gothic strategies such as remembering the torment of the repressed and witnessing the physical decay of the land. The strategies are employed to remember Viney's pain and in doing so, her voice returns after John tells her story to the audience and the antagonist is vanquished.

The Gothic genre is a western literary genre that exposes the worst in society in a fictional backdrop. The setting includes a physical decay of a once beautiful estate and the conflict between a heroine and sinister antagonist that ends with the protagonist's triumph. However, not every author follows the Gothic formula. In Hannah Crafts' *The Bondwoman's Narrative*, the protagonist's victory is her escape from bondage after cruel necessity forces her to flee. Charles Chesnutt also doesn't follow the typical Gothic formulaic plot—his short stories resurface a suppressed pain that remind descendants of both oppressors and oppressed that the suffering of the past will be heard. What makes Crafts' and Chesnutt's works differ from the mainstream Gothic literature genre is the canon the works belong to—the African American canon. Both works confront the themes of slavery and freedom, while criticizing the system that co-opts the pain of black Americans. In addition, Crafts and Chesnutt combine the interests of black and white audiences, a theoretical practice that is suggested by James Weldon Johnson. In Crafts' *The Bondwoman's Narrative* and Chesnutt's "The Goophered Grapevine" and "The Dumb Witness," there is a use of the Gothic genre to unveil the horror of systematic dehumanization in antebellum America; however, it progresses as a tool to resurface the suffering of black slaves post-bellum to remember their legacy and criticize the silencing of trauma.

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## About the Author



Sharrisse Viltus is a senior majoring in English and minoring in Public Relations. This paper was completed in the Fall 2015 semester for Dr. Emily Field's (English) African American Literature I course. Sharrisse will graduate in 2017 with a Bachelor of Arts degree; she plans to continue her education at the graduate level.



# The Clock, or Happiness is Not Ready Made

CAITLIN WESTGATE

I want to write about how I got better, but I'll never be better. The task of writing this essay was at times so overwhelming that I was unable to write at all. I'm trying to string together moments of my life into an account of how and why I am still standing here today, how I haven't given in to the dark motivations of my mental illness. This endeavor reminds me of toxic moments in my life and how happiness still doesn't come easily to me, but at the same time I feel an intense need to share my experiences in the hopes that someone out there feels a little less alone, has a little more hope. Because people tear us down, but people can build us back up—and we can build ourselves back up.

## Myself

I was in the third grade. We were studying grammar, struggling to spell words like 'receive' or 'thief,' when I absent-mindedly brushed my fingers across my mouth.

"Turn the page to 91."

I felt like I had accidentally swallowed a hard candy. My pulse was in my esophagus. Mrs. Levesque continued to discuss the grammar rules described on the following page, the page I could not turn to because I had just used my hands to touch my mouth. Who knew what kind of germs I could pass on to the next person who used that book? I positioned my elbow on the corner of the page. Maybe I could get it to turn without using my hands.

"Caitlin? What is the exception for the rule 'I' before 'E'?"

Mrs. Levesque's brown bob shook expectantly. I looked down at my book searching for an answer on the wrong page. The words blurred as I tried to conceal my panic.

"Who can help her out?" She addressed the room as a whole. My face flushed with embarrassment.

Later, Mrs. Levesque sat across from me while I completed a set of math problems, counting on my fingers underneath the beige desk. Without warning this time, the familiar feeling of just having inhaled a butterscotch candy returned, and I thought about the germs that were crawling around me like invisible fire ants. I needed to wash my hands. The deep metal sink in the back of the classroom had become my closest friend. Its rusted knobs reading hot and cold were welcoming arms; the smell of wet metal became a comfort.

"What are you doing? You haven't finished the problem we're working on."

I hovered awkwardly over my seat and looked at Mrs. Levesque with something like fear.

"I need to wash my hands." Mrs. Levesque seemed to study my face for a moment.

"How would you feel about talking to the nice lady down the hall about why you need to wash your hands so often?"

Instead of answering, I held my hands over my face and cried, watching my tears fall onto my unfinished equations. My head was a hot air balloon inflating over a small flame. I wasn't crying for embarrassment or shame, I was crying because I couldn't wash my hands.

The symptoms of my anxiety and depression made themselves known at a very young age. I began seeing a counselor in the third grade. Eventually, I was able to get past my obsession with germs. Whether it was the techniques of the counselor or the social pressures of making friends and being "normal," I was able to finish elementary and middle school without giving much agency to my mental illness. Unsurprisingly, my teenage years brought new struggles.

## Luke

My heartbeat vibrated my upper body; my stomach full on adrenaline alone. I opened up my phone to reread his text; I've got a fire burning for you, urging me to the front door. At the top of the stairs, I paused,

listening very carefully to the snores of my parents, listening for the rustling of sheets. Down the stairs cautiously, one step at a time. Five seconds between each step to make sure I wasn't heard.

Downstairs I picked my Converse up and carried them to the door. I waited another 30 seconds before twisting the knob very slowly, opening the door one inch at a time until my body could just fit. I made sure to pull the door closed until it rested on the doorframe but did not latch. I needed easy re-entry.

I glide down the porch stairs quietly, still barefoot. The air is thick with moisture and the smell of wet pine needles. Each step is painful, mud and rocks coating the soft underbelly of my feet. I rubbed the dirt off on my jeans before slipping them inside my shoes. I paced in the darkness, fighting the urge to run home at every rustle of briars.

"Hey you," he greeted me, putting the SUV in gear.

"Hi. I made you this." I handed him a CD with the word "autumn" scrawled across in pink Sharpie. He slid it into the radio and a song by Seether began to play. Let me stick my needles in / And let me hurt you again. Neither of us spoke for the rest of the ride to his house.

Our relationship was a secret. He was eight years older than me and convinced that our family and friends would not be accepting if we went public. So, in his shed, we lay on the hard cement floor with a couple of thin blankets beneath us, a small fire burning in his wood stove. I felt his fingers on me, felt like that was what I wanted, what I needed, because I hated myself more than any other person could. I had been living in a haze of depression and self-loathing for so long that I thought letting Luke use me was the kind of thing I was good for.

I didn't feel happy or complete when I stood outside of my front door rubbing spit on the brass hinges, my makeshift WD-40, so that maybe it wouldn't scream when I slipped back inside. I thought it was love when I crawled into bed afterwards smelling like sex and his cologne because I thought that the kind of love I deserved was a dull throbbing pain inside my chest. I thought it was love that made me want to hurt myself, punish myself with sharp objects.

For two years, we conducted a relationship through text messages and the occasional visit in the dead of night. He would tell me just enough to keep me hooked, to keep my young mind fantasizing and hopeful, without making any promises. We had a cyclical banter; every few weeks he would tell me he was no good for me, that I deserved better. I was too young to understand that he was not being self-deprecating or mysterious; he was just being honest. Yet, even when I would take his advice and stop responding to his advances, the messages would come in the late hours of the night,

Do you hate me

Hey

Come over

While watching *Forrest Gump*, I cried over my phone, fighting the urge to text him about how I was watching his favorite movie. Instead, my phone lit up with a text from him, What are you doing? Moments like those made me feel like we were meant to be, made me believe it when he said we could be together when I turned 18. Moments like those were cataracts; I couldn't see Luke clearly in the midst of all the small interactions I romanticized in my head.

One bright winter day I ran through the woods behind my house in a light jacket and my Converse. Each stride was fueled by anxiety and the hope that maybe I could escape the unhappiness that sat in my room next to my razorblade.

I sat down on a stump and cried over my phone, waiting for a text that was hours overdue. I had asked Luke, Will you come get me? It was a vain attempt, I knew; we never met up when the sun was out. Pretending we had a real relationship was the only way I knew how to escape my own instability. My feet became numb with cold and the winter air had penetrated my light layers. I considered what it would be like to freeze to death, waiting for his response.

Luke finally answered my text as I trudged through the snow-blanketed trails back to my house. His only response, For? I stared at the message for several moments before continuing on the path. My thumb stung with the pain of poor circulation as I held it down over the power button of my phone. As the screen powered off, I came to terms with the fact that Luke and I were both just using

each other. Only one of us was getting what he wanted.

I had become void of self-esteem, and I gave him the only thing I had left to give, my virginity. We stopped interacting completely and almost immediately after.

### **Myself**

Do you know that feeling when you're swimming and you try to touch the bottom of the pool after forgetting that you're in the deep end? That split second of panic when your feet don't touch the composite floor when you thought they would? Having an anxiety attack is like having that sensation repeatedly—only that sense of relief when you remember you're in the deep end never comes. Instead, negative thoughts circle behind your eyes and around the back of your skull like a whirlpool you can't escape.

It takes 20 minutes for me to run one and a half miles, 20 minutes to bleach my hair, 20 minutes to eat dinner. When I believed the thoughts my anxiety told me, I decided to spend 20 minutes dismantling a bright pink razor.

I had become so desperate to hurt myself that I searched how to get the blades out of a razor on YouTube (There were 55,500 results.) I waved a lighter back and forth beneath the plastic around the blades and pried and pried with tweezers before I could hold the sharp metal, about a centimeter wide and an inch long, in my palm.

It only took five minutes after I made the first cut for the guilt and shame to set in. Injuring my body was not a solution, but part of the harmful cycle of mental illness.

### **Mr. Lee**

After this particularly desperate moment, I reached out to my ex-boyfriend, Nathan, whom I knew had a good relationship with Mr. Lee, the adjustment counselor at our high school. He told me that all I had to do to get an appointment was stop by his office—a simple enough task that felt incredibly daunting. Maybe if I didn't show, it would mean my illness wasn't as serious as I thought. Nathan stopped me in a busy hallway one day a week later.

He held out a piece of paper, the corner torn off of a larger sheet.

"What is this?"

"Mr. Lee wanted me to give it to you."

I read the words, Tuesday 2 pm, scrawled in pencil. Mr. Lee had made an appointment for me, since I had failed to stop by his office.

Mr. Lee encouraged his students to express themselves on the walls of his office with black Sharpie. There were a hundred different styles of handwriting, drawings, and signatures. Somewhere amongst all of the writing were the signatures of my aunt and a close family friend whom Mr. Lee had helped decades before I started high school. There was a history of love and respect in that room. One day he told me about how they would paint over all of the writing after he retired. He did so with a quiet voice.

Mr. Lee gave me the inspiration for my first tattoo, a clock with one hand at 12 and the other at six. He had drawn the same image for me during one of our sessions.

"Life is like a clock," he told me. "One hand can be up at 12, and everything is really good and you're happy, or it can be down at six, and you're having a really tough time of it, but you just have to remember that the hands on a clock are always moving. You'll never be in one place forever. One day you'll be back up at 12."

### **Mom**

"Nathan's dad told me that you've been going to see Mr. Lee at school."

"Yeah," I responded curtly.

"Well, why?" My mother's tone was accusatory.

"I don't know. Just to talk."

"I don't understand. The troublemakers go to see him, the ones who cut class and do drugs. You shouldn't be going there."

Hurt that my mother urged me to destroy the relationship that had been so hard for me to build, I went to my room and shut the door. Most of our conversations ended this way.

My mother's lack of understanding during my struggles became the voice of my depression. You don't have the right to be depressed. You have a good life. Just suck it up. You make a big deal

out of everything. She never said any of this to me, but my own insecurity caused me to shy away from her questions and interpret her misunderstanding as disdain. I cut myself as punishment for not being better, and I wrote about it.

I was sitting in a black canvas chair writing in my red composition notebook. My parents sat at the picnic table in front of our pop-up camper while my brother chased around a football by himself.

“Why don’t you two go up to the lodge and see what there is to do up there?” my mother suggested. My brother and I looked at each other. We were both very bored. I abandoned my notebook on the seat of my chair and we walked up to the lodge where we entertained ourselves with pool and Ping-Pong for about an hour.

When we returned, my parents were inside the camper sitting at the flimsy pull-out table with my red notebook like a wounded cardinal between them.

“Roger, will you please wait outside for a second. We need to talk to Caitie.”

The skin around my eyes was red and painful as my mother tried to explain why they had invaded my privacy by reading my most personal writing. Of course, they had read the part about the cutting, the blood pulsing in globs out of open red lines in my skin. The tears wouldn’t stop as my parents expressed their concern for me.

“We never would have guessed that you were feeling like this,” my dad said. It hurt to hear him talk. I always strived to make my father proud, and knowing that he had discovered darkness in me filled me with great shame.

Looking back now, I wonder if, subconsciously, I left that notebook out in the open on purpose. I was like a Russian Nesting Doll of depression; deep inside the layers of defense mechanisms and secrecy, I was calling out for help. After reading my journal, my mother was finally able to poke a hole in the wall of negativity I had erected. She contacted Mr. Lee and discussed my progress. He suggested a female therapist that could help me on a more intimate level than he was able to at school.

My mother began checking my wrists for scars, and

she would determine the latest based on what shade of pink the raised skin was. She was abrasive, invasive, and annoying, but she protected me from myself. She was the one driving me to all of my appointments and sitting in stuffy waiting rooms while I spoke with my therapists. She was always outside the door.

## June

June and I rode in the backseat of my mom’s Ford Taurus. She handed me a small blue box.

“It’s a best friend necklace,” she smiled without showing her teeth. I pulled off the small cardboard cover to find a metal dream catcher pendant on a long silver chain.

“Aw, thanks!”

She looked at me strangely. Her eyes kept sliding toward the box in my hand and suddenly she wasn’t the generous best friend, she was Queen Ulterior Motives, your royal manipulator.

“Look underneath,” she said below the music. Her long brown hair fell perfectly around her face; she had strongly expressed how horrible it looked before we left the house. I couldn’t find one imperfection. I wanted what she had. She stretched her arm over to my side of the car, took the box, pinched the thin Styrofoam base that the necklace was resting on. She flashed the empty box in my direction, and the light caught on the corner of a shiny metal razorblade. I didn’t know what to do, so I laughed nervously and took the box back. This was her true gift to me.

I never wore that dream catcher necklace. Instead, June and I bought shiny metal razorblade necklaces from Hot Topic. They were our version of those glittery hearts that split in half, one half reading “best” and the other “friend.” Our necklaces did have a heart on them, cut right out of the middle of the blade like a terrible smile.

We would stay up all night eating Domino’s mushroom pizza, cultivating our basic Tumblr blogs, laughing and taking goofy webcam photos. There were other moments: when she asked me to help her cover up the scabbed cuts on her legs with Cover Girl liquid foundation before we went to the beach or her telling me, “You can tear off the serrated edge of a box of saran wrap and use that until I

can get you a razorblade. I mean, I'm not telling you to cut yourself, but that's what I would do."

Sitting next to June on the way to the movies one afternoon, I felt the smooth stroke of a cool finger on my upper thigh. I looked at her with a confused smile.

"What are you doing?"

"Your scar. What did you make that with?" She had dragged her finger down the length of a rosy scar that I usually hid with my shorts. I pulled the edge of my shorts back down and shrugged, avoiding the question. "I wish mine looked like that," she said quietly.

I understood then why June hadn't felt any moral hesitation when she gifted me the razorblade. She was only treating me as she would want to be treated.

At the movie theatre, she nudged me with an elbow.

"Come to the bathroom with me." I followed her into the public bathroom smelling of stale cleaning products. I pushed open the red door of the stall next to the one June entered.

"No," she made a gesture for me to join her.

"You want me to come into the same stall with you?"

"Yeah, just come on." I joined her in the stall. She laughed. June was like that. She made the strangest requests seem fun and adventurous. I was always so quiet, so timid. She pushed me out of my comfort zone in ways that were exciting and dangerous.

Once in the stall, she pulled down her jeans to show me a slew of fresh cuts covering her thighs.

"You shouldn't do that," I said more out of obligation than the thought that it would change her actions. How could I tell her not to do something so harmful if I was doing it, too?

I don't know why she decided to show me her scabs and scars that day in the movie theatre bathroom. That was the way with much of our friendship. Perhaps she was trying to prove to me how much we were alike, despite how differently we each reacted to the triggers of our relationship.

Our friendship was like a seesaw. Neither of us felt balanced except when someone equally insecure was sitting on the other side. Whenever one of us pushed up off the ground, the other would fall

fast. There was no way either of us would get better if we remained friends, so I jumped off.

### **Dr. X**

Even though I don't remember what the building looked like, I can tell you that it was old and had a lot of stairs, like every counseling center in New Bedford, Massachusetts. Dr. X had deep blue eyes like my own and told me that she could see my sadness when we spoke. I told her about my experiences with June, and she pulled out a piece of blank copy paper and drew for me the Drama Triangle: At one corner, The Victim, "Poor me!" At another, The Rescuer, "Let me help you"; and, finally, The Persecutor, "It's all your fault."

June was always the victim, and I was always the one trying to rescue her from her various persecutors: her parents, numerous love interests, herself. With a simple geometric shape, Dr. X showed me that I was perpetuating June's negativity while deflecting my own darkness.

"Now, let's see if we can get you a bottle of Prozac for your birthday." I left her office buzzed with new hope.

My feelings of elation deflated into despair when my attempts to schedule another appointment led only to answering machines and receptionists. I remember my mother's disdain, How could she just abandon someone who is trying so hard to get help, she would say to me. I had been avoiding the question myself. Maybe Dr. X didn't think I was quite sad enough. Alternatively, maybe I was too far gone for help, fallen past the rectification medication or therapy could provide. If it were not for the involvement of my mother, I would have given up on getting help once again, and this time there wouldn't be anyone passing me a note in the hallway. I would be entering college soon.

I eventually learned that Dr. X had neglected to tell me she would be on vacation the following two weeks, but my mother had already hurried me off to another therapist.

### **Dr. C**

Dr. C was a small woman who wore a matching pantsuit every day and played nature soundtracks outside of her office door. One session while my mother waited outside amongst the brays of seagulls and the crashing of ocean waves, I tried to talk to Dr. C about my distorted self-image.

“I just look in the mirror, and I hate what I see. I’ve tried losing weight, but I can’t keep myself motivated enough to go to the gym.”

“Have you tried looking at different styles of clothing that will make you feel better about the way you look?” She reached behind her to a stack of magazines on her desk. “Wearing the right clothes can really benefit your self-esteem.”

I wondered what I was supposed to do when I was in the shower with a pair of scissors ready to punish my skin for stretching so far. While my counseling sessions provided me with a great deal of insight about my condition, it only worked when I was completely committed to making an effort for myself.

After spilling my relationship with Luke onto the floral patterned rug, Dr. C instructed me to close my eyes and breathe deeply.

“Picture a TV. Now imagine that what happened between you and Luke is playing out on the screen.” I tucked my hands underneath my thighs. “You’re standing in front of the TV. I want you to start taking slow steps backward, away from the TV. Don’t stop until you can’t make out what’s playing on the screen anymore.”

We were both silent as I let the scene play out in my head. With each imaginary step I took backwards, I felt lighter.

They call this Guided Imagery Therapy. It is a mind-body experience considered a form of hypnosis. During this process, the patient reacts to the imagined scene as though it were really happening. By taking steps away from my experiences with Luke, Dr. C helped me to create a reality where I was able to move on from that trauma.

Every therapist I’ve met with has fallen short in some way, but they have also helped me in ways that I could never have helped myself. You have to be ready to accept the help you need.

## **Dr. S**

Her office was on the first floor. I can’t remember her name, but I can remember her eyes. They were very round and wet; it always looked like she had been crying when I would enter her office packed with too much furniture.

Sitting down on her couch with my mother in the armchair adjacent to me, I would tell her pretty much nothing at all. I was afraid of her eyes and the way that they seemed to feel more than the rest of her did.

“How have you been feeling?”

“Fine. I think the medication is helping.”

“She’s been sleeping a lot,” my mother chimed in. I just looked at her. “And she gets really defensive about things lately.”

After conversations like this, Dr. S would fill me another prescription for Lexapro or Celexa or Zoloft or Prozac.

## **The SSRIs**

Sometimes I wonder if the plethora of possible side effects is worth the possibility of subduing my depression and anxiety. I would cross my fingers that they’d work, and contacted my doctor if I experienced nausea, nervousness, agitation or restlessness, dizziness, reduced sexual desire, drowsiness, insomnia, weight gain or loss, headache, dry mouth, vomiting, or diarrhea.

Antidepressants are like people, I guess. Sometimes they make you feel happy and healthy, others give you diarrhea.

Trying to find the right medication is like playing back-to-back games of Guess Who™ with my doctors.

“Do they have a beard?”

“Nope.”

“Glasses?”

“I don’t know. Sometimes?”

“Do they look sad?”

At the end of the game, you’ve tried five different medications but all of your cards are still up, and you feel like you want to die.

I saw a new doctor after returning from college who

prescribed me the controlled substance Ativan after one meeting and a questionnaire:

Do you feel tired often? Yes <input type="checkbox"/> No <input type="checkbox"/> Sometimes <input checked="" type="checkbox"/>
Do you feel like hurting yourself or others?
Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Sometimes <input type="checkbox"/>
How often do you think about suicide?
Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never <input checked="" type="checkbox"/>
How often do you have feelings of anxiety?
Always <input checked="" type="checkbox"/> Sometimes <input type="checkbox"/> Never <input type="checkbox"/>

I wonder if he had an answer key on the clipboard he held on his lap. (If they answer No to question one, send them home with some antibiotics. If they answer Yes to question two, leave immediately and lock the door behind you. If they answer Always to question three, refer back to question two. If they answer Always to question four, give them the good stuff.)

## Josh

One warm August morning I received the news of my cousin's suicide. My mother's words on the phone, "Josh hung himself," bounced around my head as I drove home from work.

I sat cross-legged on the hardwood floor of my dining room with the bottom drawer of the chiffonier opened haphazardly. I sifted through the various photo albums and scrapbooks trying to find a picture of Josh, some piece of him that I could hold in my hands.

I came across a faded photograph from one of my early birthday parties. In the picture, I am standing on a chair wearing a Pokémon nightgown, hands held high in the air with a huge smile spread across my face. In the center of the photo, a little boy with dark hair sits in a chair next to me. He is turned toward the photographer, mouth

overflowing with party snacks.

During our childhood, Josh and I stumbled along the paths of our lives side by side, but as we grew into adulthood, our paths diverged. I was applying to colleges and trying to decide what I was going to do with the rest of my life. Josh was skateboarding to work at the local 7-Eleven trying to pay for a life for his daughter, born shortly after he turned 17.

"Josh got held up at the convenience store last night," my mom told me. "I saw his post about it on Facebook."

"Oh my god. With a gun?" My forehead crinkled with the disturbing image of my cousin held at gunpoint.

"I guess so," my mom replied. The idea that something so traumatizing could happen to a member of my family stunned me, but I never even asked him about it. And I never asked him about the statuses he posted that alluded to suicide. Now I ask myself why.

We were both carrying around the same dangerous pain, linked at the hip by a red string of depression, growing longer as life's gnarled fingers pulled the rift between us until suddenly the string snapped.

Now, I drag the string along my path alone, through mud and moss. The end is frayed, but I'm still pulling it.

## Scar Tissue

"What did that scar come from? Did you cut yourself or something?" My coworker laughed as she gestured to the thick scar on my forearm.

"Yeah, actually." I smiled awkwardly. There was a time when I would have told some transparent lie. My boyfriend's cat scratched me. My arm got caught when I was climbing over a chain link fence. For once, I decided to just be honest. Lying would protect my coworker from the embarrassment, but someone had to be embarrassed, and this time it wasn't going to be me.

Her eyebrows rose. "Really?" I nodded. "Oh, crap. I'm really sorry. I didn't know."

"It's fine, I promise."

"You know, I take medication for my anxiety. And I stayed

in a mental hospital once.”

By being honest about my own mental illness, I was able to connect with my coworker on a level that wouldn't have been available to me if I had just lied and directed the shame inward. I used to try my best to hide my scars. I used to tell people, “I'm fine,” when they asked me if I was okay; yet, what helped me the most during my recovery was reading blogs like *To Write Love On Her Arms*. Reading about other people's experiences with mental illness made me feel less alone and gave me hope for recovery.

Hiding my illness had only ever brought me guilt and shame. It's still difficult to be completely honest, but being open about my mental illness has helped my recovery as well as the recovery of others. We don't need to keep quiet any more; social media and personal blogs have given those suffering from mental illness a platform from which to speak truthfully and compassionately about their struggles. Since becoming more open about my struggles, people praise me for my courage. I don't feel so weak anymore. If people see my scars and recognize them as symptoms of mental illness, I know that I don't have to be ashamed.

You have a favorite pair of jeans. By continuing to wear them, you cause the fabric to rip and tear. You don't want to throw them away, so you just keep sewing the fabric back together. The jeans are covered with the small seams where you have repaired the breaks. You still wear them because, otherwise, you'd have wasted a lot of time and string.

I don't hide my scars anymore. If I were ashamed of them, that wouldn't be progress. My scars are the remnants of the physical pain I caused myself; they are proof that I have healed. They are reminders of moments of weakness; they are evidence of my strength. They shout mental illness to everyone I meet; they tell you I am a survivor.

## **Myself**

After months spent wallowing in guilt and grief after my cousin's death, I decided to schedule an appointment with a new therapist in New Bedford.

As I was getting in the car to go see her, my mother's Jeep pulled into the driveway. She rolled down her window.

“Hey, where are you going?”

“I'm actually going to a counseling appointment.” She smiled.

“That's good. See you when you get back.”

At the counseling center, I met a stout Portuguese woman in her 50's wearing cheetah print heels and drinking water out of a plastic Dunkin Donuts cup. After a few sessions, she helped me to accept Josh's death for what it was: his decision. At the same time, it became clear that I had decided to live. Mr. Lee once told me that he saw a fire in my eyes. I like to think I have preserved that fire, my will to live a healthy life.

I wish that I could tell you I haven't cut myself since that night with the tweezers and the razor, but it wouldn't be true. I wish that I could tell you, though, that I didn't go off my medication this week, but that just isn't honest. I can tell you that I am now in a loving, healthy relationship, that I lost 20 pounds through diet and exercise, and that I was able to finally kick my addiction to cigarettes. I have learned a great deal about the complex nature of progress.

My experiences have shaped who I am today. My struggles with anxiety and depression are at once debilitating and strength giving. Looking back, the accuracy of Mr. Lee's analogy strikes me once again. I have traveled back and forth between dark and light times, but I've never remained in any of those places. Instead of letting my illness dictate where I will stay, now I am deciding where I want to go. I'm learning how to move the hands of the clock closer to 12.



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## About the Author



Caitlin Westgate is a graduating senior majoring in English and Writing Studies. Her research project was completed in the Fall 2015 semester under the mentorship of Dr. Lee Torda (English) and made possible with funding provided by a Semester Grant from the BSU Office of Undergraduate Research. Caitlin works as an editor for *The Bridge*, the fine arts journal on campus, and as a writer for the news/media website *The Odyssey*.







