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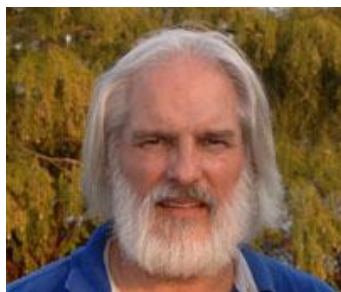
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PROGRAM OVERVIEW		
7:30-8:40am	Registration, Poster Set-up in the Campus Life Center	Ballroom
8:40-8:50	Welcome: Dr. Tom Moore, USC Upstate Chancellor	CLC Ballroom
8:50-9:00	Opening Remarks: Dr. Melissa Pilgrim	CLC Ballroom
9:00-9:50	Keynote Address: Dr. Louis Guillette, Medical University of South Carolina	CLC Ballroom
9:50-10:00	<i>Attendees/Presenters Report to Breakout Sessions</i>	
10:00-11:15	Breakout Sessions 1, 2, 3, 4	
	Breakout Session 1: Psychology of the Zombie Apocalypse	CLC Ballroom
	Breakout Session 2: History & Political Science	HEC 2001
	Breakout Session 3: Chemistry & Physics	HEC 2039
	Breakout Session 4: Business & Entrepreneurship	CLC 317
11:15-11:25	Coffee Break	
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	Breakout Session 5: Culture & Society	CLC Ballroom
	Breakout Session 6: Literature	HEC 2001
	Breakout Session 7: Biology I	HEC 2039
	Breakout Session 8: Linking Pedagogy with Student Outcomes	CLC 317
12:50-2:00	Lunch	CLC Ballroom
2:00-3:00	Poster Session	CLC Ballroom
3:00-3:10	<i>Attendees/Presenters Report to Breakout Sessions</i>	
3:10-4:10	Breakout Sessions 9, 10, 11, 12	
	Breakout Session 9: Psychology & Sociology of Relationships	CLC Ballroom
	Breakout Session 10: Linguistics	HEC 2001
	Breakout Session 11: Biology II	HEC 2039
	Breakout Session 12: Informatics	CLC 317
4:20-5:20	Fireside Social and Award Ceremony	Roel Pavillion
5:50-6:20pm	Poster Breakdown & Distribution of Reviews	

Keynote Speaker

Dr. Louis J. Guillette, Jr., holds a professorship in obstetrics and gynecology at the Medical University of South Carolina and is the CoEE Endowed Chair in Marine Genomics at the Hollings Marine Laboratory. Professor Guillette received his doctorate in comparative reproductive biology from the University of Colorado at Boulder in 1981. Professor Guillette was a distinguished professor of biology at the University of Florida for 25 years, where he was an award-winning teacher of biology, embryology and reproductive biology. In 2010 he was awarded the Heinz Medal, considered the major international award for work in the area of environmental health. He is internationally recognized for his research in the field of reproductive and developmental biology, having published over 300 papers and edited five books. His research examining the role of environmental contaminants as inducers of birth defects in various wildlife species and children has drawn international attention. His current work examines the molecular (genomic and epigenetic), cellular and endocrine mechanisms associated with genital and gonadal development and contaminant-induced abnormalities.



Are Zombies Bad for Your Mental Health Too?

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Psychology

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Abstract – The Walking Dead (Darabont & Hurd, 2010) affords us the opportunity to study the effects of disaster and aftermath on vulnerable populations. This fictional representation of people in crisis can serve as a diagnostic tool to help train or increase skills in disaster response. Using Carl as a model, we can identify whether his mental health is affected; and using his interaction with the group, we can determine various projections about the future of the character. Though Carl does not exhibit any signs of disaster related disorders, or decreased mental health, he is at extreme risk for developing adverse mental health in the future.

Keywords – Walking Dead, Disasters, Psychosocial, PTSD

Introduction

Disasters can affect people in many different ways; not only because of the traumatic events themselves, but also because of the succeeding events, or the aftermath. There are specific ingrained responses to disaster, or what we perceive as threats: fight, flight, or freeze (Ksiazak, 2014 January 10). In the event of a disaster, our brains are acting from a more primal state, responding on a more primitive level using the hippocampus (Ripley, 2008). Common reactions to disaster include loss of senses, memory, and rational thinking. What this means for those who suffer from a disaster is that they can often incur equal, if not increased damage from the aftermath of the disaster as well as the event itself. To illustrate this, we have used the popular television series *The Walking Dead* (Darabont & Hurd, 2010) in an attempt to analyze the effects of disasters and their aftermath.

Disaster Research

Disaster related research is confined by nature. As researchers, we are limited in our ability to analyze the effects of disaster to responding to naturally occurring disasters. In those situations, research into psychological responses to disaster is not a high priority. Thus, a researcher is only able to survey the affected population or create an experiment to analyze disaster and aftermath effects. Except, we cannot always survey affected populations due to relocation, death, injury, and

any number of post-disaster conditions. If we are able to survey an affected population, we cannot do so during a disaster or in the immediate aftermath, thereby affording us the chance to collect data from survivors only after a prolonged time period. This post hoc data would be weakened by survivor's recollections due to the time lapse between the disaster and research, and could be vulnerable to a number of additional concerns, as we've seen from studies conducted in the past (Roberts, Mitchell, Witman, & Taffaro, 2010). We also cannot induce disaster conditions in an experiment. The ramifications of conducting an experiment inducing real disaster conditions would be horribly damaging and highly unethical. While there are certain constraints we face when using the show for analysis, *The Walking Dead* is almost certainly one of the most realistic disaster affected populations we can expect to observe in the moment, given the aforementioned concerns. Though the show is fictional in its content, the reactions of the characters' are meant to portray an accurate or at least quasi-accurate representation of human response to disaster, trauma, death, tragedy, etc. Therefore, analysis of *The Walking Dead* can actually provide useful diagnostic material relevant to post-disaster issues. In an area where field study is usually subjected to flaws and expense, utilizing popular media such as *The Walking Dead* can prove a useful training tool.

SCENARIO

The Walking Dead chronicles the story of a group of survivors squaring off against zombies. The characters in season one of the series have escaped death and un-death, but their lives are threatened almost daily. Carl Grimes is the character we will be analyzing for signs of mental health issues post-disaster, but there are a number of other characters who play a large part in his reaction to the Zombie Apocalypse. Prior to the rise of zombies, Rick Grimes was a Sheriff's Deputy. He is married to Lori, and they have a son: Carl, age 12. Shane Walsh, another member of the group, was Rick's partner and his best friend. These characters all comprise Carl's family unit at one point. Another important figure in Carl's life is Sophia, a young girl his age. These characters are the most

influential in Carl's life during the *Zombie Apocalypse*.

It is revealed in "Wildfire" that the zombie virus went global 63 days ago. We know that Rick recently awoke in the hospital from a coma before becoming part of the group, and Dr. Edwin Jenner of the CDC said the virus spreads like wildfire; therefore, we can assume that it has been approximately two months since the virus became a disaster. Though the timeframe may seem like a nonissue, it can actually help us pinpoint different individual responses to the disaster, as well as group response. Since the disaster is ongoing, the actual response from survivors is different than we could expect to see in the survivors of other disasters which are not as extensive in duration. If we try to compare the group to where a normal survivor population would be in terms of recovery, we can see that the phases of disaster will be much longer for the group because of the ongoing trauma. However, using the disaster model (Ksiazak, 2014 January 23) we can see that the group is progressing through the stages of response at a somewhat normal pace, given small variance to account for the ongoing nature of 'Impact'. One of the ways we see the group trying to adapt is in their creation of a new normal. Though life is not the same, it does gain a semblance of normality, especially for the children. Instead of attending school, they routinely learn from textbooks and parents. They continue to be able to play and engage in childlike pastimes. When the group travels to the CDC in Atlanta, they experience standards of living which they had not possessed in the camp. For children, the success of adapting to disaster situations and maintaining mental health is a return to routine and normalcy (Rao, 2006). The "maintenance of the status quo" (Cox & Perry, 2011, p. 408) is important in recovering from a disaster.

The most common disorders arising from disasters are post traumatic stress disorder, depression, and substance abuse (Ksiazak, 2014 January 16). Carl does not exhibit overt symptoms of any of these. Though we do not see Carl documented in every moment, when we see him, we never see signs of these disorders, indicating Carl has good mental health. Perhaps this is because of his resilience or his moral development, which will be discussed further in the analysis.

Ripley (2008) bases her theory of disaster response on three stages: denial, deliberation, and decision. Through extensive research into a variety of recent traumas, Ripley crafted her three stage response, which values the importance of resilience. Resilience is the main factor in determining how people will respond to a disaster:

"They believe they can influence what happens to them. They find meaningful purpose in life's turmoil. They are convinced that they can learn from both good and bad experiences," (Ripley, 2008, p. 230). In Carl's case, it is difficult to determine his resilience; however, we can see that he has not given up hope, and he learns from both good and bad experiences. Also, the lack of affectedness we see in Carl posits that he must have fairly high resilience. In "Vatos", episode four of season one, a large walker horde attacks the camp, killing and biting several people. Once Carl sees the walkers attack, he immediately runs to his mother. In Ripley's stages, this response is in the decisive moment, where he chooses to act and follows through. He does not exhibit signs of denial or deliberation, which suggests that he has prior training in disaster situations. This instantaneous reaction increases his likelihood of survival because he takes less time to either deny or deliberate about the situation. In a disaster, where every second counts, his quick action could save his life.

Based on Carl's decision and his attitude, he is in Stage 4 of Kohlberg's Moral Development Theory (Kohlberg & Hersch, 1977), in the Conventional Level. Stage 4 is the law and order orientation, characterized by recognition of rules, respect of authority, and accepting one's duty. Given his close relationships with police officers like his father and Shane, a surrogate father and camp leader, it is not surprising that he is fixated on authority. Carl's behavior provides insight into his moral reasoning, even though he doesn't make any difficult moral choices. He is respectful towards his parents and the other adults in the camp. He takes on the role of the little protector, comforting his mother when Rick leaves the camp. He never exhibits selfishness or self-absorbance. This behavior is consistent throughout the season, and reflects the law and order orientation.

Though it is never explicitly determined in the first season, given Carl's focus on authority in his moral development and his previous experience with leadership, it is reasonable to predict that he will take over a leadership role as he grows older. He has already exhibited signs of conforming to society's expectations of him by conforming to models of accepted behavior and emulation of his father. Rick is a model for Carl, and he sees his dad in charge. His father is raised to superhero status because his decisions are always right, both morally and practically, a case of supererogation that Carl must live up to. Rick's natural leadership abilities result in the group acceding to his will. What Carl sees is Rick's behavior being reinforced by the group. So, if Carl wants to be a leader, he will follow Rick's example. Though Rick is somewhat of a fair

leader, allowing for input from others, he has a staunch moral code. This authoritarian leadership style is useful in crises (Rosenbaum & Rosenbaum, 1971). When Carl grows older, it is likely that he will develop a similar leadership style.

In the second season, Carl's behavior changes dramatically. He begins to exhibit signs that indicate his mental health is deteriorating. The loss of normalization, both from the camp and the CDC, are factors in his altered behavior. The loss of home and space can be one of the most important, as discussed by Cox and Perry (2011), as it can correlate with a loss of self. There are also additional factors that affect Carl's behavior, as more traumatic events happen after the group leaves Atlanta. The Diathesis-Stress model (Ksiazak, 2014 January 16) states that an increase in stressors results in higher risk for developing a disaster related disorder. The major things that he has lost in the six episodes of the show in season one: three homes, friends, and others he knew. This inability to stabilize or normalize does not bode well for his mental health. Then, he loses Sophia, the only friend his own age that he has left; and Shane's tensions with Rick escalate as Shane spirals into anger and resentment. With the group tearing itself apart, the cohesion that we see in season one is no longer apparent. Carl's family tensions are fracturing the group.

The constant addition of stress places Carl at extremely high risk for developing a disaster related disorder. Though Carl still does not show signs or symptoms of depression or substance abuse, he does exhibit signs of Post Traumatic Stress Disorder or Acute Stress Disorder in season two. In addition to his altered behavior, the normally reserved Carl becomes more sullen and aggressive. He stops communicating with others, even his parents. The nature of the walker trauma is ongoing because there is no end date to the disaster, and to confuse matters even more, there are multiple traumatic events simultaneously occurring, all of which could impact Carl's mental health.

Conclusions

As of the conclusion of the first season, Carl seems remarkably well adjusted. He does not exhibit any signs of disaster related disorders. He is in the law and order moral development stage. He is the successor to a reign of leadership, being trained to take his father's place once he is older. Despite these positive notes in the first season, Carl's mental health is at risk in future episodes/seasons. The stress that he has

experienced so far is compounded with additional stress from the CDC debacle, and other traumatic experiences which occur in season two. Given what we know about stress and mental health, it is reasonable to believe that Carl could be at risk of developing a number of disaster related disorders, including PTSD. Though his mental health in the first season is well adjusted and sound, this could be because he is not a prominent member of the camp, and is not onscreen as much. Moving into season two, we may be treated to more of Carl, which could help us reform or support this analysis.

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Carol Peletier Zombie Survival Guide

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Abstract – Carol Peletier is a character in the AMC series, *The Walking Dead*. The series portrays how individuals and groups respond during a zombie apocalypse, and thereby general disaster scenarios. Her pre-disaster behavior includes domestic abuse and a lack of social connectedness. Her post-disaster behavior includes becoming a caregiver and completing domestic tasks. Carol Peletier is someone capable of surviving the trauma despite preexisting mental health conditions. Her moral development is in the early stages, but she displays strong moral beliefs in gender roles and protection of camp members. Carol adds to overall group cohesion through similarity to group members and a mutually beneficial relationship with group members.

Keywords – Coping Mechanisms, Zombie Apocalypse, Walking Dead, Natural Disaster, Group Dynamic.

Introduction

While a zombie apocalypse disaster is not likely to occur, the scenario does provide a working metaphor for disaster preparedness and post disaster behavior. The television series *The Walking Dead* (Darabont & Hurd, 2010) effectively shows how individuals may react to the trauma of a disaster scenario on their own and within a group. Carol Peletier is accurately represented as someone capable of surviving the daily trauma of the zombie apocalypse. Despite stagnated moral development, Carol is able to be an engaged member of her survival group.

Moral Development

For most of the first season, Carol fits into the Pre-Conventional Punishment and Obedience Phase. This is the first stage of moral development according to Kohlberg and Hersch (1997) and is common in children, but can be present in adults as well. During this stage, an individual's moral code is dictated by reward and punishment. Actions leading to a reward are considered to be right actions while actions leading to a punishment are considered to be wrong actions. While most people move past this phase, Carol remains in this phase because of Ed, who is shown to be physically and emotionally abusive to Carol and her daughter, Sophia. This has led to Carol determining right and wrong action on how Ed will react and how he will

punish or reward her. Whatever makes Ed happy, such as saving him from embarrassment and accepting abuse in the episode "Tell it to the Frogs" is the right thing to do. Conversely, anything that might upset him, such as Andrea standing up to him in the same episode, is the wrong thing to do. Carol's punishment is always abuse from Ed, and her reward is always no abuse.

An individual's morals are not defined only by their Kohlberg stage. Carol shows her moral beliefs in the scenes leading up to Andrea's and Shane's altercation with Ed in "Tell it to the Frogs." When Jacqui asks why the women are doing the housework while the men appear to be relaxing, Carol says to her that it is normal for women to do the housework and for men to relax. This shows a strong belief in traditional gender roles. Carol accepts the roles with no complaint, and even does domestic chores without being asked, such as washing Rick's clothes upon his arrival to the survival camp. Carol also displays a moral obligation to care for her husband Ed. In "Wildfire," Carol seems to feel a moral obligation to care for Ed, even in death. She sees Darryl about to officially kill Ed by destroying his brain with a pickaxe and takes the pickaxe from Darryl. She explains to Darryl that she has to care for her husband simply because he is her husband and is therefore her responsibility.

Post Traumatic Growth and Group Dynamic

Carol is able to benefit from and be a benefit to the group she has become a part of as a result of the disaster. Carol shares with most group members a desire for survival and benefits from being a part of the group because of her enjoyment in the domestic chores necessary for comfort. Since she uses the chores as a coping mechanism, she is unlikely to engage in the social loafing, that is she will do the tasks that are necessary as opposed to expecting someone else to do them. Carol further shows group cohesion through similarity with other members of the group. For example, Carol and Lori are both mothers struggling to raise a child during the trauma. The biggest example of group similarity is a shared fear of death by the walkers that constantly surround them. Fear has been shown to

create the strongest group cohesion, as every member has something to work against (Morris et al., 1976).

Carol's positive group skills are not limited to domestic chores. Her other skills include child care, first aid, and understanding the emotional state of group members. Carol is often shown to act as a nanny to the children. She often shields both Sophia and Carl and is trusted by Lori to care for Carl at the camp and within the CDC. She is able to protect every member of the group in the small way of general first aid, shown when she cared for Ed's injuries from his altercation with Shane in "Tell it to the Frogs," and soothing Jim's fever as best as she can in "Wildfire."

Finally, she is able to read emotions of members of the group. This is most obvious when she knows that Ed is upset and offers to go with him to placate him. She is also able to see that Lori wants to relax at the CDC and takes the children to the game room. Reading emotions means that she can recognize when a group member is upset and may be able to calm them, as she does Sophia after the attack on the camp results in Ed's death. She also comforts Jim after his digging scene in "Vatos" scares the children, and says to him that his actions were not his fault, but a result of heatstroke that altered his decision making ability. Even though these gestures are small, they have a strong impact on each individual and reveal that Carol can act as a therapeutic aid when a group member is scared or feels hopeless. The only negative aspect of her peacekeeping attitude is that it could quickly transform into groupthink. Groupthink is when a member of a group does not want to risk angering other group members and accepts any decision (Ripley, 2008). This means that Carol might not speak up when things are going badly because she risks social isolation or punishment.

Mental Health

Carol has been in an abusive relationship for over thirteen years, as Sophia is twelve years old. This could be the precipitating event for the two psychological disorders for which she shows symptoms. Throughout the first season, Carol shows symptoms of depression and post-traumatic stress disorder (PTSD). Both conditions are common in abused women, with PTSD occurring in higher rates than depression (Bargai, Shakhar, & Shalev, 2007). Evidence to her depression is seen through her expressions of self-blame when Ed is beaten by Shane in "Tell it to the Frogs" and when she shows little interest in anything other than domestic chores. Carol's symptoms of PTSD are more obvious than her symptoms of depression.

Ed threatens Carol with serious injury in "Tell it to the Frogs" when he tells her she will regret her decision if she chooses to stay with the other women rather than leaving the lakeside with him and going back to the camp. This shows that she is not only threatened with physical injury, but is reminded of physical injury regularly. Threats from Ed then lead to estrangement from others, as is shown during the aforementioned campfire scene. Another symptom of PTSD is sleep disturbance, a symptom Carol reveals when the group arrives at the Center for Disease Control (CDC) in "TS19." The final symptom of PTSD Carol displays is hyper vigilance. Carol displays hyper vigilance in her scenes with Sophia, because she often keeps Sophia at her side or wraps her arms around Sophia's shoulders. If the depression and PTSD were present before the outbreak, they may get worse during the outbreak (Ksiazak, 2014, January).

The Diathesis-Stress Model shows a disorder that existed before a catastrophic event can be made worse by the event itself, as the event creates new stressors for the individual (Ksiazak, 2014, January). There is a risk that Carol's symptoms will get worse as the stress of the outbreak adds to her preexisting conditions. However, individuals who have experienced a prior trauma have stronger stress management and coping skills than do individuals who have not experienced a prior trauma (Bonanno, Pat-Horenczyk, & Noll, 2011). According to this research, Carol is able to manage her stress better than other members of the group because she has already lived through a traumatic experience in the form of the abuse at the hands of husband.

The pre-existing conditions have taught her various coping skills. She finds comfort in domestic tasks, as she is able to focus one thing at a time and even have moments to herself, such as when she is ironing in "Tell it to the Frogs." She also seems to find comfort in caring for other people, such as the kids in the camp and Jim when he is sick. She also takes joy in small pleasures. This optimism is shown when the group arrives at the CDC and Carol is excited by the idea of hot food, hot water, and a good night's sleep. Carol is therefore adequately prepared to not only cope with trauma, but survive the trauma and eventually move past it to begin life again. She is able to seem very stable in spite of the disaster, based on the fact that she is able to complete daily chores and tasks. She is therefore able to find peace in chaos, something that will definitely help her mental health during the apocalypse scenario.

Conclusions

Carol Peletier is a woman who has been through more than her fair share of trauma in her life and now must cope with another, albeit different, trauma. She grows from a weak, subservient, woman to the predominant caregiver of her group, contributing to overall group health in numerous ways. She herself has personal struggles, such as caring for her daughter and her own fragile psyche, but she will most likely survive the trauma of the zombie apocalypse.

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The Walking Dead Character Analysis

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Abstract – *This paper will look into the many aspects of disaster response by analyzing a major character from AMC's The Walking Dead. These aspects are morality, group dynamics, prosocial behavior, and posttraumatic growth. These aspects can be affected by disasters and this paper will look into the effects using The Walking Dead as an example.*

Keywords – prosocial behavior, disaster response, group dynamics, posttraumatic growth, moral psychology

Introduction

AMC's *The Walking Dead* (Darabont & Hurd, & Darabont, 2010) is an imaginative view of a zombie apocalypse and the varying shades of reactions to it. In this paper, I will analyze Rick Grimes, a sheriff's deputy from a small town in Georgia, as he attempts to cope with the hellish nightmare that is now his world. I will also look into his moral development throughout the first season as well as his interactions with other survivors and the impacts he has made to group dynamics. I will also explore Rick's current mental status, as well as predict whether he will engage in prosocial behaviors and/or posttraumatic growth.

Moral Development

Rick reasons at the fourth of six stages according to Kohlberg's theory of moral development. He wants everybody to "show respect for authority and maintain the given social order" (Kohlberg & Hersh, 1977, pg. 55). An example of this behavior and moral reasoning is when Jim is bitten by a walker. Daryl wanted to put a pickaxe through Jim's head but Rick stopped him because it is not right to kill the living. Another example of his level of moral reasoning is when Rick handcuffed Merle to the pipe. He adhered to the rules that attacking and demeaning a person are not right in the eyes of the law, especially since Merle uttered multiple racial slurs towards T-Dog. However, in some instances Rick tends to think at the fifth stage, in which he bends what were the rules and laws of normal society. According to the law, it is illegal to kill a person; however, Rick eventually does not consider walkers to be human at all and finds it perfectly normal to kill any walkers that threaten him or his companions. Stage

five thinking indicates a belief that the law could be changed in terms of social utility (Kohlberg & Hersh, 1977). Rick's sense of how things should be or "ought" (DeLapp, 13 January 2014) widens as he transcends the conventional level of moral reasoning. Rick's rule-based ethics shift from deontological towards utilitarian. Had Rick not shifted his ethics from deontological to utilitarian, then he would not have been able to cope with shooting a young walker in the head. With a more utilitarian stance on his morals, Rick can justify that shooting a young walker in the head is perfectly legal because walkers are not the same as humans and therefore do not have rights.

Effect on Group Dynamics

Rick as a person seems to be a charismatic and delightful individual. He acts like any prototypical hero should in an apocalyptic situation. He should not show any fear and be able to protect and support for the ones he loves. In any group situation, Rick seems to assume the leadership position. This could be attributed to his charismatic disposition and typical Southern charm. When he and his fellow cops stop a person on the lam, he is the one in the group who gives orders. When he joins the band of survivors from Atlanta, Rick takes the leadership position as well to help them survive and make it back to camp, where he steps into the leadership position as well. His style of leadership seems to be democratic in nature. During times of stress, "groups tend to show preference for authoritarian leaders" (Ksiazak, 14 January 2014) but Rick's leadership does not fall into this category at first. Rick does not force Morales and his family to stay with the caravan to the Centers for Disease Control and Prevention (CDC), because Rick does not lead in an authoritarian style. Morales' eventual lack of cohesiveness with the group comes off as abnormal. People subjected to fear conditions tend to group together (Morris, Worchel, Bois, Pearson, Rountree, Samaha, Wachtler, & Wright, 1976). In this band of survivors, there appears to be a low level of highly dominant members. There was a presence of groupthink that could be attributed to "the lack of disagreement and a high level of confidence in the group decisions" (Callaway, Marriott, & Esser, 1985, pg. 950). An example of groupthink would be the decision to travel to the

CDC in hopes of a cure. Shane and Lori expressed their concerns to Rick but never seemed to follow through with them when the group is together as a whole. It can also be argued that Rick and Morgan engaged in groupthink in the first episode, because they both believed that help and a cure could be found in Atlanta, specifically in the CDC. They did not argue or even assess the risk that there could be hoards of walkers in a large city such as Atlanta. Although Rick may be a charismatic leader, he is still susceptible to groupthink and its consequences.

Potential Posttraumatic Growth/Prosocial Behavior

Rick does not show any signs or symptoms that could indicate any type of stress-related mental disorders. Even though he is vulnerable to developing acute stress disorder, he displays resilience that he may have gained while he was in his old career as a sheriff's deputy. Likewise, Rick does not seem to be developing or displaying any signs of depression and substance abuse and dependence. According to Cox and Perry (2011, pg. 396) however, "the ramifications of displacement for the health and wellbeing of those affected are profound". Rick may be fine now and may not exhibit any signs of mental illness currently; however, his wellbeing may deteriorate years later from all the stress of having to worry about the wellbeing of everybody and zombies being everywhere. He may also experience a sense of disorientation from having lost what was a considered a normal life, as well as being displaced from his home for what could be a long period of time. However, Rick may be more likely to engage in prosocial behavior since he has experienced trauma (Frazier, Greer, Gabrielson, Tennen, Park, & Tomich, 2013). In some aspects, this engagement in prosocial behavior may benefit Rick as much as it benefits society (Reeves, Merriam, & Courtenay, 1999; Steffen & Fothergill, 2009). This probability would also increase due to his upbringing in the Deep South and the hospitality exhibited in this particular area. If Rick can engage in good coping strategies as well as prosocial behaviors, he can prevent posttraumatic growth from occurring in the future after the apocalypse subsides.

Conclusion

Rick Grimes goes from one traumatic experience to another without reprieve. He shows resilience that other characters seem to lack. His previous training as a police officer overall increases his chances of survival. Rick's low sense

of risk also increases his chances of survival. Throughout the season, Rick seems to transcend conventional moral reasoning and deontological ethics into utilitarian ethics and post conventional moral reasoning when it came to the decision of whether walkers were actual humans or not. His shift also increased his chances of survival, because he could exterminate the walkers without hesitation. Rick's charismatic personality provides him with multiple opportunities to become an unnamed leader within any group he joins. However, he attempts to maintain the social norm of a democratic leadership. The group composition is one that is not desirable for survival in that it does not contain many highly dominant individuals. This leads the band of survivors to groupthink, which can lead to disastrous consequences. Although he is vulnerable to developing acute stress disorder and eventually posttraumatic stress disorder from his job as a sheriff's deputy, he does not show the symptoms for either of these disorders. However, it is very likely that since Rick has lost some sense of place with the seemingly permanent displacement from his home, he may develop some sort of psychological illness. However, his resilience and increased likelihood to engage in prosocial behaviors can prevent this from occurring in the future. Overall, Rick seems to be better off than other characters seen in the first season in *The Walking Dead*. He is a likely candidate to survive this zombie apocalypse with most of his sanity still intact.

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Shane Walsh's Decisions and Demise

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Abstract — *This paper will use examples from the television show The Walking Dead and relevant course readings to analyze the decisions made by the character, Shane Walsh and the outcome of said decisions. I will explore various factors, including narcissistic and antisocial behaviors, that eventually lead to his downfall and will evaluate why he ultimately did not survive the zombie apocalypse from a psychological and philosophical perspective.*

Keywords — Zombies, The Walking Dead, Shane Walsh, Psychology, Disasters, Survival, Narcissism, Morality

Introduction

AMC's hit television show, *The Walking Dead*, is popular not because there are bombastic special effects or because there are amazing actors involved with the show (although those are great reasons why), but because it challenges its audience to ask itself "What would I do if this happened to me?" Through complex characters and creative storytelling the show portrays a world in which zombies take over the Earth and are instinctively set on bringing humanity to extinction. The protagonists of the show are forced to learn how to survive during a never-ending disaster while maintaining relationships with one another. One character that seemed to have everything in his favor was Shane Walsh. Shane is initially a leader whose quick decision-making and dead-eye weapon skills make him an invaluable team member. As the series progresses, Shane's behavior becomes more erratic as his natural narcissistic tendencies are exacerbated by the stress of living in an apocalyptic world. By examining his actions, one can not only rate where Shane went wrong, but can possibly find and increase one's own chances of survival by learning from his successes and mistakes.

Analysis

Behavior and Survival

The zombie apocalypse is a fictional scenario that depicts the real life possibility of a worldwide catastrophe. In the book *The Unthinkable: Who Survives When Disaster Strikes – and Why*, Amanda Ripley interviews hundreds of people who survived major catastrophic events and tries to correlate what behaviors were similar and

what kept these people alive. Characters in *The Walking Dead*, who are living during the zombie apocalypse, experience the looping roller coaster daily. Arguably, the show takes place after many have experienced the first denial stage, including Shane. Everyone is now forced to plan each action out to maximize the endurance of their group or themselves. Shane has an advantage as a police officer. He is trained to be able to make decisions quickly and to plan tactical moves. His body and mind are conditioned to respond reflexively, meaning he acts without putting much thought into it while still incorporating his police training. Men, according to Ripley, are more likely to take risks and are more likely to be heroes (Ripley, 2008). People who are physically fit are also more likely to survive in disaster situations just for the reason of being faster and able to get away more easily. Shane is a man and is in peak physical condition. His physique and training have helped him gain leadership status and aided him in being able to save Lori and Carl. Being able to care for a family gives Shane purpose, despite the fact that he is single with no children of his own, and gives him a chance to be a hero.

Morality

Shane's attitude shifts once Rick returns, thus taking away his reward for surviving: Lori and Carl. Much like in the Doris experiments where people would not help others if they did not find a dime in the coin return at the pay phone, Shane ignores the needs of others at times because he hasn't gotten any reward, and the fact that Lori is no longer interested in him once Rick comes back gives him no more incentive to be helpful. Doris' findings also contend that a sense of urgency has an effect on one's willingness to help others (Doris, 2005). One such instance of this is the circumstances by which Otis dies. Shane is not only worried about his own life, but he is in a hurry to be sure and save Carl's life. Otis becomes expendable, and Shane's willingness to help is greatly reduced.

Group Dynamics

Shane is dominant and aggressive. Dominance is a stress reducer when it comes to group decision-making because decisions are made quickly and are not of high quality (Callaway, 1985). This makes

Shane more likely to be an effective leader in the group. Unfortunately, many of Shane's reactions are often volatile, which makes him unpredictable. Shane's interactions are often concerned with his relationship to Lori. Before Rick comes back to camp, Shane holds the primary leadership position among his group members. His interactions with others are often short-tempered. One character that challenges him is Dale. Dale remains suspicious of his character throughout the series. Shane takes on an authoritarian attitude when it comes to Dale. Authoritarian modes of control are often favorable in times of crisis (Fodor, 1976). While Dale is suspicious of Shane, he is willing to follow his lead before Rick arrives. Often Dale is seen as the voice of reason on the show and Shane is depicted in sharp contrast to that. While his decision-making is quick, his emotional well-being often gets in the way of him making rational choices. Rick is a major variable on how Shane acts towards the group. Because Shane respects Rick and was once his subordinate before the outbreak occurred, he often looks to Rick as a leader, although in true dominant personality form, he often questions the decisions Rick makes.

Shane views Rick in an almost sibling like way. One could say that Shane is jealous of Rick and always has been. While Shane was single, Rick had a family. While Rick was leader, Shane was co-leader. Everything that Rick had and has, Shane wants.

Mental Health Evaluation

It can be argued that Shane possesses narcissistic and antisocial tendencies. Before the outbreak, if he had gone to therapist, his tendencies would have probably fallen into a normal spectrum. Narcissism describes a disorder with patterns of "over grandiosity, self-focus, and self-importance behavior" (King, 2007). Shane's narcissism can be seen in his idealization of Lori and his loss of authority to Rick. Lori's criticisms enrage him. He sees the life that Rick has and envies it, hoping to eventually possess Lori and Carl. He feels that he is better than Rick and is crushed that Lori doesn't see it that way. Shane's antisocial tendencies are also exacerbated as he is further traumatized. He purposefully shoots Otis, a man who accidentally shoots Carl, but brings the group back to help Carl and the injured T-Dog. Otis is sacrificed to zombies so that Shane has a means to escape a horde. He also convinces the group that a young man they've captured named Randall needs to die, despite what the group believes. Shane has problems controlling his temper and flies into rages, becoming a threat to the group and to himself. Shane is eventually killed twice: Once as a human by Rick and once by

Carl as a zombie. Because Shane is no longer under the constraints of rules, he feels entitled to assert his authority over others who he feels are weaker than he. Shane believes that he is able to turn off his emotional switch when he needs to do so. Because Shane exhibits narcissistic tendencies, trusting him as the leader would not be beneficial to the rest of the group. Ultimately his envy and need to control gets him killed.

Conclusions

Shane Walsh remains to be one of the most charismatic and complex characters on *The Walking Dead*. His quick decision-making abilities and physically fit body make him an ideal survivor, however narcissistic tendencies eventually form anti-social behaviors, ultimately leading him to lose his most important relationships and die in the process. Because of Shane's primal instincts taking over his empathy, he loses in the zombie apocalypse. His aggression, wish for power, lust for Lori, and loss of empathy all become the last nails in Shane's coffin.

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Survival and Development, The Zombie Apocalypse's Salvation of Daryl Dixon

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Abstract – Utilizing texts on disaster response and post trauma recovery, the character of Daryl Dixon from AMC's *The Walking Dead* is examined for his potential for posttraumatic growth as well as the likelihood of his survival. While Daryl is initially a fairly pragmatic character he shows remarkable personal growth even in a stressful situation and displays an increase in moral and prosocial behavior. With the development of these behaviors his interpersonal relationships improve and provide the necessary social framework for his post disaster resilience.

Keywords – Survival, development, zombies, behavior

Setting the Scene for Character Development

Disasters, both natural and otherwise have significant effects on many aspects of those who experience them. Many authors, such as those referenced within this paper, believe that some individuals may be predisposed to respond to disasters with greater success due to a variety of personality characteristics and behaviors. Utilizing the popular television show, *The Walking Dead* as a medium for discussion the author explores the character Daryl Dixon to present a case for the validity of those traits in increasing an individual's chances of survival. Additionally, I will give evidence that Dixon's experiences in the apocalypse led to his development into a more sociable and resilient individual.

Daryl Dixon

Daryl Dixon, a physically capable and resourceful person, exhibits many qualities that increase his likelihood of survival. Ripley (2008) identifies characteristics, such as self-confidence, that increase a person's likelihood of surviving a disaster. Daryl displays body language such as walking with purpose, and speaking very directly or even harshly when angered with the people around him. Additionally, Daryl also possesses personality traits that indicate he has a forward focused mentality. Qualities that Daryl possesses that are strongly correlated with forward focus include the ability to keep calm and focused, the ability to stay focused on goals or plans and the ability to distract oneself from a traumatic event. While it is not evident in early episodes, Daryl later also comes to

possess qualities such as focusing on the needs and comforts of others, especially within the group (Bonanno, 2011). Daryl possesses multiple traits that indicate a high probability of survival. This is shown through the alignment of his actions and development with the research of those studying disaster responses.

Moral Development

Kohlberg and Hersh (1977) described moral development as occurring in a set of stages. In his early characterization Daryl could be identified as having "stage two" morality. This stage of morality revolves around logic that is directly or indirectly self-serving, with the thinker focused on making choices that lead to reward for himself.

However, as Daryl develops he passes through the third, fourth and fifth stages of moral development as described by Kohlberg, showing increasingly more complex and abstract moral reasoning. Eventually, he enters into Kohlberg's sixth and highest stage, in which he follows a sense of principle and respect for the other survivors as individuals. This is an area of development that changes very dramatically throughout the show and contributes largely to Daryl's development of relationships and prosocial behaviors.

Interpersonal Relationships and Group Dynamics

Though Daryl's early interactions often detract from his survival group's cohesiveness, he has a complete change of attitude after the disappearance of his brother. He grows to have a reserved, yet friendly dialogue within the group.

Daryl develops into a leader within the group and he is often sought out by the group's leader, Rick for his opinions. He even becomes one of Rick's trusted allies within the group. Daryl is often deferred to on matters such as tracking and looked to as a defender. He is often willing to take on tasks that seem difficult to the group, such as providing the blow to the head needed to eliminate zombies and prevent corpses from reanimating as zombies. In this sense, he is looked to when the group needs leadership in situations he has knowledge of or when there is a need for someone to take point on a dangerous expedition, though not necessarily for things such as judgments on group behaviors.

However, according to Fordor (1976), this is a type of leadership, as groups tend to vary in their preference for different leadership styles based on current needs, rather than having a single leader who transitions within different leadership styles.

Mental Health

Over the course of the show, it becomes clear that Daryl has been the recipient of abuse as a child, and he does display behaviors that could be described as “posttraumatic” according to Roberts, Mitchell, Witman and Taffaro (2010). However, given that *The Walking Dead’s* characters live in a world of ongoing traumas, these behaviors may really be adaptations to the situation. For example, while being overtly tense or suspicious are considered to be “posttraumatic” behaviors, given the ever-present fear of attack not only from zombies but also raiders, these behaviors may be both wise and advisable. Other than excusable behaviors in this category, Daryl does not exhibit obvious signs of depression, anxiety, or physical health symptoms (Roberts *et al.*, 2010). Post-disaster care for Daryl would be necessary to show definitively that these behaviors will not have a lasting negative effect, but they seem to be adaptive given his situation.

Posttraumatic Growth

Though disasters often negatively impact those who experience them, there still remains the potential for personal growth resulting from the situation. The sustainment or creation of “orienting frameworks (i.e. the attachments to and evaluations of the material and social world) providing a sense of belonging, whether that is experienced as belonging or not belonging, in place, relationships, routines, and intentional engagement with the world” (Cox, 2011) can provide those involved in disasters with meaningful avenues for posttraumatic growth.

When he joined the survivor group, Daryl only had his brother Merle. In the wake of losing his brother, Daryl begins to form much healthier, more fulfilling and deeply rooted connections to the rest of the group. In this alone, his attachment to the social world has increased. He has established a place in the group as a provider, trusted protector and even as a temporary leader. Daryl has increased his sense of belonging and begun to interact with the world around him with far more purpose. This place in the group provides him with a meaningful and trusting relationship with Rick as co-protectors of the group. Later, Daryl also develops a romantic attachment to Carol, another member of the survivor group. When Carol’s daughter Sophia goes missing, Daryl engages in prosocial behavior when he risks his own safety by

hunting tirelessly to try to find her even when it is not required or expected of him by the group. Additionally, he seeks out ways to comfort Carol in her distress, such as presenting her with a Cherokee Rose.

Conclusions

By the reasoning presented, not only does Daryl have the potential for posttraumatic growth, but his potential for personal growth is much greater than it was pre-outbreak. He now has these established relationships, a forward focus, an increased sense of morality, an awareness of his effect on others and more positive and mutually supportive social relationships. He displays confidence, few if any signs of mental illness and a will to survive that will serve him well in his social relationships and post-apocalyptic survival. Given these changes, Daryl is more likely to create and sustain adaptive behaviors than he would have been before the disaster. Though many individuals experience long-term negative effects of disasters, it is interesting to note how in this instance the individual experiences a long-term positive effect.

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Thucydides and the Universal Currency of Power

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Abstract — *This study analyzes Thucydides's political paradigm of political justice between nations of unequal power through the exposition of his History of the Peloponnesian War. It specifically focuses on the Melian Dialogue and examines how power ultimately influences the views of two factions regardless of any sense of morality. The rhetoric of both the Athenians and the Melians is closely scrutinized as they argue the major points of the debate such as the dividing line between weakness and morality, honor versus self-preservation, and the decadent nature of hope. Furthermore, the Melian Conference is analyzed for use of application of modern international relations and power struggles. Overall, the Melian Conference highlights how power serves as the undisputed mediator of interactions between separate states.*

Keywords — Thucydides, Peloponnesian War, political realism

Introduction

The *History of the Peloponnesian War*, recorded by Thucydides, recounts the fifth-century war between the Delian League, led by Athens, and the Peloponnesian League, which was headed by Sparta. The war began when Athens sought to control Greece by using its position within the Delian League and forcing tribute from all those from within the League. As Athenian power grew, the city-state sought to gain control of other cities in Greece not in the Delian League. This practice did not abide well with many of the Greek city states, including Sparta. Those who refused to pay tribute to Athens rose under Spartan leadership to form the Peloponnesian League.

Thucydides, an Athenian general and historian, is labeled as the father of scientific history for his well-renowned, dogmatic empiricism in his analysis of history. Likewise, he is also accredited being the father of the realist political model, especially in matters concerning international affairs, due to the consistent theme of power being the deciding factor between nations rather than morality. Political realism, or simply realism, stresses conflict and competition. In contrast to realism, idealism is a standpoint that focuses on cooperation, rather than the competition, among states. One example that portrays Thucydides's realist paradigm is the

Melian Conference, a fictionalized narrative held between the cities of Melos and Athens. Here, the argument presented by the Athenians is a matter-of-fact, realist perspective, reflective of many other of Thucydides's political philosophies found throughout his work. The Melians argument follows an idealistic paradigm. Ultimately, Melos refuses Athenian demands, and it is conquered by Athens.

The Melian Conference serves as a strong basis for the debate between realism and idealism due to the philosophical division between the opposing parties and as an argument that power is what issues the verdict when two or more differing states cannot find shared moral standing. Furthermore, it serves as the driving incentive for all nations who are in a position of supremacy and leaving morality out of the decision-making process. The argument in support of power can be divided into three major sections: the Athenian ultimatum and the question of weakness versus mercy, the dilemma between the Melians' sense of honor and the self-preservation of its people, and the debate of whether hope is logical for the weak or simply an ideological fantasy.

Exposition of the Debate

At the beginning of the confrontation between the opposing parties, when Athens issued its ultimatum to Melos, the Melians tried to appeal to the Athenians's sense of goodwill. They declared that they only wished to remain a neutral party in the Peloponnesian War, separate from both the Peloponnesian and Delian Leagues. As not to appear weak, the Athenians felt that they must visibly show their power against the Melians. The Athenians offered little reason for the conquest other than that they were strong, and it was the nature of the strong to conquer the weak. Nonetheless, the Melians argued, "You enjoin us to let right alone while you only talk of interest, that you should not destroy what is our common protection, the privilege of being allowed in danger to invoke what is fair and right, even to profit by arguments not strictly valid" (Thucydides 331). Ultimately, the Athenians had no response other than that Athens must invade a weaker nation. If

they were so confident in their strength, why did they feel threatened by the Melians' neutrality? For Athens, the answer was simple. The Melians' lack of allegiance to either party made them a prime target to increase their own power. Thus, it is clear that Athens's decision to confront Melos was out of a desire for imperialistic control rather than the protection of its borders.

As Melos saw that appealing to Athens's empathy was futile, it made attempts to appeal to the Athenians' sense of honor instead and claimed that subjugation to Athenian rule would be a great dishonor representative of cowardice. The Athenians countered by trying to appeal to the Melians's sense of reason, stating that since they are not equals in power and strength, it is not a matter of dishonor, rather a question of self-preservation by not endangering their people to the wrath of those far stronger than themselves. While it may not have been easy for the Melians to accept Athenian rule, it would have been worse to sacrifice the lives of their people trying to combat odds far outside their favor. If they were not considerate of the lives of their people, perhaps they were as immoral as Athens. Thus, if Melos truly cared for is morally right, they would have had to submit to Athenian will so that they might avoid the bloodshed of their own people.

As the debate waned, the Melian envoys made a final attempt to persuade the Athenians to see their side. They claimed that the gods would find favor in them for being moral and rebuke the Athenians for their transgressions. They also try to persuade the Athenians that there exists a possibility of Athens's own defeat. The Athenian envoys scoffed at these propositions declaring that hope was only to be "indulged by those who have abundant resources" (Thucydides 333). The Athenian standpoint, while certainly harsh, was a valid point. If one side was willing to sacrifice all simply because of belief or feeling, despite whatever reason or logic dictates, such a decision ultimately could lead to devastating consequences. Choosing to give in to Athens would have been, as Athens argued, a matter of self-preservation. The tragedy of the Melian Dialogue was that the Melians followed their hopes and were slaughtered and enslaved as penance for that fatal mistake.

Application of the Melian Conference

The Melian Conference contains three primary premises. First, morality is ultimately subjective by its very nature. Thomas Hobbes, a renowned realist who having observed the tentative nature of morality, stated, "Whatsoever is the

object of a man's appetite or desire, that is it which he calleth good, and the object of his hate or aversion evil" (Arthur 2). Certainly, it would seem that the Athenians found themselves just in actions as had the Melians. Athens believed that by conquering Melos they were protecting themselves in case the Melians eventually decided to attack. Athens also showed generosity by allowing the Melians to submit first. Furthermore, The Melians believed that the Athenians were being inhumane by not allowing them to live peacefully as a neutral party. Neither Athens nor Melos was willing to submit to the other's views, and other measures had to be taken to settle the dispute.

Second, in the interactions between states, power often serves as a universal currency. Human lust for power decided the fate of Melos. Power is a swift and bureaucratic method of producing victor. However, power, like morality, is fickle in nature. It feels no conscious or remorse and will quickly shift from one opposing side to another. Melos warns Athens of the possibility that some day they might be in a similar situation. The Melians claim, "Your fall would be the signal for the heaviest of vengeance and an example for the world to meditate upon" (Thucydides 331). In the arrogance of their current state of power, Athens brushed aside this notion saying that the end of their empire did not frighten them. If they had known of their future defeat at the hands of the Spartans, how would their perspective be adjusted towards the Melians? Nonetheless, power dictated the victor between Sparta and Athens as it had with Melos and Athens.

Third, when no moral standing can be found between the states within conflict, power will issue the final verdict. The reason that the exchange between Athens and Melos was unsuccessful was because there was no common moral ground to be found. Both Athens and Melos were convinced that their positions were right and just. Thomas Hobbes later examined the relationship of power to justice when he stated, "Where there is no common power, there is no law: where there is no law, there is no injustice" (Arthur 4). There was no common power or authority that could judge both Athens and Melos. Aristotle once noted, "The state come into existence to satisfy the bare needs of life, and continues for the sake of a good life" (Cochrane 35). The United Nations presently serves in the role judging and mediating disputes between feuding nations; however, no similar body existed in the Melian Conference. With neither nation willing to budge in their beliefs, no mediator or judge to rule in favor of one party or the other, nor a lack of objectivity to make decisions because of the presence of moral subjectivity, power was left to

serve as judge, jury, and executioner. With these conflicts visible on an international scale over two thousand years later, one must ask if the lessons taught by Athens and Melos through Thucydides will be remembered or ignored.

Conclusions

The Melian conference represents a powerful debate between two parties who could not be more opposite from one another in the political and moral leanings. The Melians, with their idealistic hopes and appeals to morality, and the Athenians, strongly grounded in their fact-of-the-matter realist paradigm, provide for an excellent analysis of both realism and idealism. The conflict between them elicits many questions concerning morality, honor, and imperialism. It is imperative to remember that whatever one's personal opinion about the moral controversy concerning this situation might be, both sides considered themselves just in their standing. Without a conclusive agreement between the sides, war became inevitable, and only the mightiest would survive. In the end, Thucydides's Melian Dialogue demonstrates how morality in its subjective nature cannot always be agreed upon. When this occurs, another currency must be used to pay the penance, namely the currency of power.

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The Issues Surrounding Somalian Piracy

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The civil war in Somalia began in 1988 and caused the government and the country's economy to collapse officially in 1991. This paper explores a major international consequence of the collapses, namely piracy. Four major factors, which this project analyzes, came together and pushed many Somalian people to steal resources otherwise lost or unobtainable after 1991. While the risks for pirates are minimal, the possibility of rewards is great. Piracy in 2014 has evolved to reflect a diversity among Somalian-pirate culture, and created an international affair.

Keywords- Somalian Piracy, History, Military Action

Introduction

Somalia has been battling a civil war for the last twenty years. This war has taken the lives of over 700,000 men, women, and children, and it caused mass devastation and destruction to the African country. There are countless issues involving lack of government, resources, education, and money in the Federal Republic of Somalia, which has become unstable to the point of anarchy. Piracy has become a regular activity in the nation, and navies around the world work together to put an end to it. An estimated 250 ships were taken over between 2010 and 2013. The numbers remain around 100 per year. The pirates of Somalia have been using their tactics for various reasons since the early 1990s. Resource pirates are most often seen, and experience discrimination and punishment for their actions, although some commit piracy to get supplies to which they would otherwise not have access. Somalia lacks a stable government, suffers abuse from other countries, and possesses a weak police force. A decimated economy has been the source of many of these problems, which then triggered piracy. Piracy thus has become a means of survival for many the Somalians as well as problem for many international governments and navies.

Effects of Piracy in Somalia

Four main factors can lead to an increase of piracy: the existence of a favorable topographic environment, lack of a stable government, weak law enforcement and weak political will of government to enforce order, and a cultural environment not opposed to piracy. Somalia meets all four criteria.

Located on the Horn of Africa, surrounded by the Gulf of Aden and Arabian Sea, Somalia is at an assessable spot for surrounding countries to invade their waters. Following the civil war of Somalia, they were left with no official government to aid in protecting their people and resources. Much of Somalia is controlled by a corrupt and oppressing police force which does more harm to Somalians than it helps. Having no access to essential resources, many of the Somalians support their pirates because of their capability to maintain the resources they need to survive.

Pirates began attacking ships between 1989 and 1991, at the start of their civil war, to prevent resources from reaching a devastatingly corrupt government. These were known as political pirates. Once corrupt officials were taken out of their offices, defense and resource pirates began to appear. Their appearance largely resulted from mass fishing in Somalia waters by surrounding countries. These same countries dump large amounts of waste into Somalian waters, beginning in 1994, causing a mass depletion of fish populations. Since these countries were not punished for their crimes against Somalia, they committed atrocities relentlessly. Defense pirates, called so because they use violence to protect Somalian interests and resources, have attacked ships from other countries in an effort to maintain a healthy, full water and fish supply. Somalia continues to fight these abuses to protect the few resources available. Along with pirates who are committing these crimes with reasonable cause originated ransom pirates, who only used piracy to get large sums of money. These pirates have been reported to make upwards of \$5.4 million dollars by holding people aboard ships for ransom. Each group of pirates is diverse in that they use piracy for different causes, but the result of their actions always makes Somalia a more dangerous and unstable place.

International Interference in Somalia

With the increasing number of pirate attacks coming from Somalia in the last twenty years, great military action has been put forth to prevent attacks at sea. Members of the North Atlantic Treaty Organization (NATO) surrounded Somalia's waters, seized ships, and arrested Somalian crews

capable of committing acts of piracy. On the pirate ships, foreign militaries have often found large amounts of machine guns, ropes, ladders, and other means tools for attacking ships. What must be understood is that in a country with as much corruption, poverty, and war as Somalia, these pirates have no other way of providing resources to the people that need them. Military action, such as seizing the pirate vessels, can cause many Somalian people to suffer because they cannot gain access to resources they need to survive. World governments have bonded together to end piracy in the Horn of Africa, where Somalia is located, but the sources of piracy is economic strife. Piracy is committed by impoverished people who have found no other means of surviving aside from being pirates or fishing. Resource pirates risk their lives living in a dangerous, unstable country without a capable government and will do anything they can to provide for their people. Crime has proven to be their only viable solution. The majority of military actions have been ineffective because it stops essentials from reaching Somalian people and simply encourages piracy more. Only fixing the root of the problem, namely immensely poverty and lack of resources, may serve as a reasonable, effective solution to stopping Somalian piracy.

Conclusion

The threat of having no resources for people constantly living in war and poverty can only lead to a complete collapse of state. Somalia already suffers from a low standard of living that continues to drop daily, and it is in desperate need of a cure to its political and economic problems. Having no stable government, clans rule the streets relentlessly, and third-world poverty has devastated Somalia. The funding to stop piracy could be put forth to help Somalia. If the people had access to necessary resources, a majority of the crimes committed by Somali pirates would end. The poverty of Somalia, a direct cause of piracy, has indirectly created an international problem for governments around the globe. Internationally, governments spend millions each year to prevent piracy. Military action, as has been show, is an ineffective solution to the problem. Only providing resources may stop much of the piracy from Somalia.

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“She is not that much of a Lady”: American Women of the 1920s

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Abstract - Some view the attitude of the 1920s women as a form of rebellion; however, looking back today, we realize it was the spark of a revolution. Although, women during this time were looked down upon they ultimately helped create the women of today. However, some feel this is not a positive change; we are who we are because of our country's history.

Keywords - Cultural revolutions, women's history, Feminism

Not So Positive Coverage

As women were breaking from tradition, newspapers increasingly reported on the change, with more attention given to the philosophy behind the new woman. As with most societal shake-ups, articles in magazines and newspapers sensationalized and exaggerated certain aspects of their status. Women were seen as rebellious because their new tradition of independence. Their independence also included how women attempted to modify how they acted around others. In part, the changing image of women was closely connected to defiance. Most were beginning to question whether the traditional girl would ever get back to the way she used to be. *The Literary Digest* mentions, “Is ‘the old-fashioned girl,’ with all that she stands for in sweetness, modesty, and innocence, in danger of becoming extinct?” (“Literary Digest: Topics of the Day” 1). Advertising was reaching more of the population, so it only begs the point that more people were viewing the messages that spoke through advertising. How these messages were incorporated into one's life was up to the individual. Advertising and the newspapers potentially were helping women spread their beliefs, yet most advertising agencies consisted of men. As the population became bombarded with new forms of advertising, the message of the new American woman was brought to the attention of society at large.

Introduction

A revolution was unfolding during this new-found Progressive movement; not so much as to focus on industry but the woman as a strong independent person; it was time for change. Everything around her was changing so why not join the movement. American women of the 1920s did not always portray qualities that some in society would label “lady-like”. Considered the inferior sex in a society dominated by men, this era was ripe for change. A new image of women transformed in the 1920's. Shorter hair, wearing shorter dresses, and an attitude of rebellion became prominent. The new women of the 1920s were not content remaining second to men. Not all women agreed with the revolution now taking place. While some embraced this new attitude, the remainder clung to tradition.

The Image She Portrayed

The image of the new woman both shocked and called into question what 1920s American society willingly accepted. With shorter and less clothing women felt freer and more self-confident. This new-found confidence led to a feeling of superiority and empowerment and they were able to break or bend traditional rules of society. Women symbolized a statement of equality. If a man could walk around with short hair, then so too could a woman. One of the more shocking images of the 1920s American woman was that of women who smoked and drank. Considering that this image was more relatable to a man, it was one of the more controversial of the era. The message of the new American woman was based on strength, independence, and determination.

Rising to the Top

During the Progressive Era, large numbers of men experienced the fear that their wives would join the new women movement and leave them. If this did occur, she may have perceived the changes taking place as a way to gain even more independence. Little did men realize that a cornerstone of this movement was the male sense of superiority. Men were considered as overbearing based on their occupations and physical strength. Women were not allowed to do difficult jobs, as defined by society, nor were they allowed to hold high-paying occupations. This in turn was a setback because women no longer wanted to be considered

the second-tier gender. As a consequence, women fought back and began to make headway in the workforce. They entered various positions in industries, working long hours, despite minimal wages. Although this was not what some deem fair, it was a point from which to start.

Life in 1920s America was hardly easy for the general population, especially for women. For most women, it was difficult to step out of the household as they were seen as housekeeper or child bearers. American women of the twenties took advantage of new business opportunities to promote their independence. As one writer claimed in *American Women in the Progressive Era, 1900-1920*, "Women substituted for men in all sorts of jobs, on trains and streetcars, in blast furnaces and foundries and refineries, in producing steel plate, high explosives, armaments, and plane parts" (Schneider 224). In addition, a 1918 article from *Vanity Fair Magazine* mentioned, "...so far as being shocked at the thought of women in political office is concerned, we have seen so many frail, tender, meticulous, fussy, garrulous, epicene creatures holding the highest place under [office]..."(Jones). Women knew they were capable of working outside the domestic sphere and sought to prove it by entering male dominated jobs.

She Did What?

The most controversial characteristic of the New Woman of the 1920s concerned sexuality. Although women were not permitted to be with the opposite gender alone, they were given small amounts of freedom when they went to mixed gender settings. Females were not respected if they put themselves in a position where men could take advantage of them, because it broke tradition. As these women went out with the others they often times accessorized to become even flashier. Wearing flashier and more provocative clothing provided a sense of confidence in the New Woman of the 1920s.

Conclusion

Women of the 1920s were not always the innocent, conforming, women they were portrayed to be. The image of the New Woman provided a foundation social change. Beginning with fashion and attitude, women drastically transformed the idea of what women would be in the twentieth century. The thought of a woman drinking or smoking seems normal today, but for the 1920s this was either repulsive or celebrated. Although veering from tradition appeared vulgar or immoral,

women knew the outcome would be a freer America for them.

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Peaceful vs. Non-Peaceful Segregation: An Examination of the Methods of Martin Luther King Jr. and Malcolm X in the Civil Rights Movement

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Abstract — *Martin Luther King Jr. and Malcolm X were two of the most influential civil rights leaders in the 1960s. Although their methodology was completely different, these two men made great strides in the Civil Rights Movement. King wanted to use peaceful methods and Malcolm X was willing to use violence to obtain civil rights. This paper compares and contrasts the methodologies of both. Ultimately, the peaceful methods of King worked, giving him more respect among scholars and African-American activists; whereas, X's methods relegated him to the status of a revolutionary focused on revenge rather than the desire to bridge the racial gap in America.*

Keywords: History, Civil Rights Movement, Martin Luther King Jr., Malcolm X

Introduction

Martin Luther King Jr. and Malcolm X were two African-American activists who essentially wanted the same goals but sought them in very different ways. Martin Luther King Jr. wanted to make African-Americans and Caucasians equal using peaceful methods while Malcolm X was willing to use violence to accomplish his goals. Malcolm X did not like the ways Caucasian Americans treated African-Americans. He was willing to get a group of men together to use violence against Caucasians to make them treat the African-Americans with respect. Martin Luther King Jr. also did not like the way African-Americans were being treated, but he wanted to gain the Caucasian's respect through non-violent methods. Martin Luther King Jr. did not want anyone to get hurt while the African-Americans were gaining the respect of the Caucasians. The ideas of King and Malcolm X persist through poetry, which also reveals the problems in their opposing methodologies.

Analysis of Martin Luther King Jr. and Malcolm X

In 1963 during the Civil Rights movement, Martin Luther King Jr. gave his famous speech "I Have a Dream", which emphasized how he wanted to end segregation through peaceful methods.

During his speech King said, "We must not allow our creative protests to degenerate into physical violence. Again and again we must rise to the majestic heights of meeting physical force with soul force" (938). King wanted Americans to become part of his dream. He stated that African Americans should not be satisfied with unequal rights, such as being disallowed to vote in Mississippi, being banned from using public facilities, and suffering police brutality (King 939). In his speech, King explains mistreatment of minority groups and how they are considered lower than "whites", but he does not provide a solution to inequality. Gwendolyn Brooks talks about this issue in a poem she wrote about Martin Luther King Jr. Brooks writes, "His Dream still wishes to anoint/ the barricades [...] of control" (1333), claiming that King does not call for action. She says that his speech was powerful and insightful, but it did not give African Americans any control over the unique situation. According to her poem, King's idea of the "Dream" persists but the lack of a solution continues to the present as well.

Malcolm X also wanted to bring about the end of segregation but was willing to use violence to obtain it. Malcolm X supported violence to promote respect through fear. In an attempt to protect African Americans in St. Augustine, Florida, Malcolm X sent a telegram to Martin Luther King Jr. saying, "just say the word and we will immediately dispatch some of our brothers there to organize self-defense units among our people, and the Ku Klux Klan will then receive a taste of its own medicine" (Malcolm X-Documents Telegram). Malcolm X wanted to show Caucasians how beatings and discrimination felt, and he was willing to use whatever means necessary to do so. For Malcolm X, violence served as a tool to show "whites" that discrimination was unethical and dangerous. Amiri Baraka supports the violence of Malcolm X in his poem "A Poem for Black Hearts" when he says, "For Great Malcolm a prince of the earth, let nothing in us rest until we avenge ourselves for his death, stupid animals that killed him, let us never breathe a pure breath if we fail" (1447). This poem depicts Malcolm's violence by

arguing that African Americans need to avenge his death through violence. Malcolm X was fighting for equal rights, not superiority. Baraka carries Malcolm X's ideas farther by promoting control and superiority, ideas implied in Malcolm X's vision of violence.

Malcolm X made it difficult for Martin Luther King Jr. to complete his goals by supporting violence. This support of violence caused many to ignore King's message of peace. Malcolm X said, "I want Dr. King to know that I didn't come to [...] make his job difficult. I really did come thinking I could make it easier" (Malcolm X- Quotations). Malcolm X tried to help Martin Luther King Jr., his methods instead hindered his contemporary. When Malcolm X offered to send aid to punish "whites", King turned him down. In an attempt to accomplish the goal of obtaining equal rights, Malcolm X invited Martin Luther King Jr. to a rally where several African American leaders were going to talk about racism. Malcolm X wanted King to come to the rally to present his views about verifying equal rights and freedoms for all Americans (Malcolm X-Documents Letter). Malcolm X respected and praised King, but the methods that Malcolm X used to accomplish his goals were so different that he became a hurdle to Civil Rights.

Conclusion

King and Malcolm X went about getting segregation two different ways but both had a great influence on the end of segregation, one through love the other with fear. Their lives are still remembered today through poetry such as Brooks and Baraka's. These two individuals show how each man lived and how he strived for his goals. The methods of each leader affected races of all kinds throughout the U.S., and although different in strategy, each had the same goal in mind. Their influential lives helped found the blueprint in the structure of life that liberated African Americans and opened the door for racial equality for all other races.

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Jazz Embracing The Civil Rights Movement

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Abstract: This paper examines the relationship between Jazz and The Civil Rights Movement and it draws upon two examples to analyze this relationship. First, Max Roaches music explicitly explores ideas common to The Civil Rights Movement. Second it draws upon the experiences of club owners who experienced it first hand. Jazz there by became a tool through which African Americans could explore their concerns with inequality. Although Martin Luther King and Malcolm X most often are associated with Civil Rights Movements of the 60s, Jazz served as an ideological foundation for the movement during preceding decades.

Keywords: History, Music, Civil Rights Movement

Introduction

At The Berlin Jazz Festival in 1964, Dr. Martin Luther King claimed that jazz “speaks for life,” and believed that God endowed human beings with the ability “to cope with [their] environment in many different situations”. He assumed they could find a true sense of identity by working together to end racial tension in America, but many African-Americans felt that a genuine sense of identity could only be heard through the voices of music because they were restricted by segregation. Music became a viable way for them to be heard by other races in general. They believed a civil battle could not be won with violence, but rather through the strong words of individuals. They were determined to explain their struggles as a race, but only in a way that could bring about change in the hearts of their people. Jazz served as a foundation for the accomplishments of the Civil rights Movement through cultural expression, to ignore the laws that restricted them from being heard and promote social unity among African Americans.

Club Owners

Jazz presented people with the opportunity to express themselves outside of the negative connotations of the Jim Crow. The Jim Crow had a huge impact on the lives of blacks and in many cases even whites. Segregation created a wall between the races and fractured society, leaving blacks severely disadvantaged in education, status, and employment (“Civil Rights Movement”). In the early 1940s a few club owners tried to create clubs where African-Americans and whites could be seen

together and enjoy the company of one another, which helped to create a more equal society, though it was only behind closed doors (Hentoff). Café Society became one of the most successful jazz clubs of the 1940s. Barney Josephson, founder of Café Society in New York, believed in an establishment, “where blacks and whites could come together behind the footlights and [sit] together” (Hentoff). He knew that if society had a chance to change, then it would have to be through cultural institutions like music. The majority of African Americans wanted respect for themselves. They used music a tool to break down segregation throughout the infested country.

Max Roach and the Individual Black Musician

A black musician’s essential responsibility was to entertain white audiences. They were simply not allowed to play alongside white musicians. There was not a law stating they could not, but sadly the idea of “Mr. Crow” had consumed the South. It was not until “after hour sessions” that many black and white musicians had a chance to play together. Historian Nat Hentoff recalls white musician Bix Beiderbecke playing with Louis Armstrong in Chicago. He also recalls a young white child stating that Mr. Armstrong “was the first genius he had ever seen”. It was evident jazz music was beginning to sink into the minds of the prejudice. Many whites who expressed it were “beginning to [talk] about segregation” and its limitations. (Hentoff). African Americans were judged for their abilities regardless of color and race, their lyrics projecting a message of equality. They found their voice, through music, and it was with this voice that they began to sing the whispers of change to come, changes that they hoped would free them from the chains of Jim Crow.

One example of Jazz’s ability to speak for equality is Max Roach’s jazz piece “Freedom Day.” The speaker addresses African Americans about the “rumors flyin[g]” about freedom (“Freedom Day” line 2). Although the song offered a clear concise answer to some of the many questions African Americans asked, it also explored the everyday struggles that were taking place in America. Both the speaker and the audience work together to

emphasize the importance of spreading freedom. The connection to civil rights suggests the speaker is actively engaging the African American community into a new level of understanding about equality. Roach repeats "Can't conceive it, can't believe" twice in the song ("Freedom Day" line 3). The statement illustrates the doubts African Americans had about the possibility of equality with whites. True freedom seemed an impossible goal to achieve. The speaker wants to promote this idea by giving them something to believe in, saying, "we've made it [to] freedom day" ("Freedom Day" line 14). The destruction of slavery represents the first step towards equality. Despite the many concerns they had, African-Americans felt the right "to vote and earn...pay" had already been accomplished to an extent. The speaker hopes the lyrics of "Freedom Day" will promote equality by bringing minorities and whites together ("Freedom Day" line 13).

Conclusions

For many years, African-Americans musicians dreamed of a world of equal opportunity. In 1963, Dr. Martin Luther King responded with his "I Have a Dream" speech, which he hoped would open the minds of thousands by noting the struggles displayed in jazz. He symbolized the importance of curing social change, yet he preached that soon an "oasis of freedom and justice" was not far behind (King). It was evident his message was intended to explain the same struggles being heard in jazz, which he considered a remedy for the corruption in society. Jazz gave African Americans a voice, and with this newfound voice they expressed themselves and told the story of the wrongs that committed against them. Because they found a way through which they could express their unique experiences. Unlike generations before them, they received recognition for their talents, which prompted them to push for equality through jazz.. Though the messages portrayed today are different, one can infer that the struggles being heard from the 1940s to the late 1960s were embodied in the embrace of music.

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Temperature Effects on the Morphology of CdSe Nanocrystals

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Abstract — We report a simple method for modulating the morphology of CdSe nanocrystals. By lowering the temperature of the cadmium oleate to 250 °C prior to injecting the selenium precursor, nanocrystals exhibiting bi-pod morphology can be synthesized. Unlike the traditional dot morphology, the electron-hole pair of the bi-pod is not confined in all three dimensions. When the temperature is raised above 280 °C, the more traditional dot morphology is achieved.

Keywords — CdSe, Electron Microscopy, Nanocrystals, Morphology Control

Introduction

Semiconductor nanocrystals have been an active area of research for the past 30 years (Brus, 1984; Byung Hyo Kim, 2014; Zheng Li, 2011). Recently, research in the synthesis of semiconductor nanocrystals has shifted to focus on methods to control the morphology of the nanocrystals (Albert D. Dukes III, 2010; Anisha Gokarna, 2005; Zheng Li, 2011). Traditionally, cadmium selenide nanocrystals have been synthesized with dot morphology, which results in a structure that is confined in three dimensions (Brus, 1984). More recently research has shifted to methods for synthesizing semiconductor nanocrystals which confine the photo-generated electron-hole pair in only one or two dimensions, while growing the material to bulk lengths in the other dimensions. Several morphologies including wires (James W. Grebinski, 2004), disks (Zheng Li, 2011), and tetrapods (E. C. S. Liberato Manna, and A. Paul Alivisatos, 2000) have been synthesized with bulk lengths in at least one dimension.

Often, in order to synthesize nano-materials which are not confined in every dimension, care must be taken to choose the correct surface ligand as well as the concentration of this ligand. The prevailing theory is that the direction of growth can be controlled by choosing ligands which bind more tightly to particular facets of the nanocrystal, thus preventing growth along that facet (L. W. W. Liberato Manna, Roberto Cingolani, and A. Paul Alivisatos, 2005). In this work, we report a synthetic strategy for synthesizing nanocrystals with a bi-pod morphology that is not confined in all three dimensions, by simply altering the temperature of

the reactive cadmium precursor at the time of the injection of the selenium solution.

Experimental Procedures

The synthesis of the cadmium selenide nanocrystals is adapted from the method developed by Yu and Peng (a. X. P. W. William Yu, 2002). The reaction was carried out as follows: 1 mmol of CdO was combined with 10 mL of 1-octadecene and 2 mmol of oleic acid in a three neck flask that was fitted with a bump trap, temperature probe, and rubber septum. The reaction mixture is purged with argon through a 12 gauge needle until the temperature reaches 120 °C. The purge needle was removed and the reaction mixture was heated under an argon atmosphere until the solution became colorless and reached the desired temperature (the temperature at the time of injection was varied between 250-310 °C). Once the reaction mixture reached the desired temperature, 10 mL of 0.1M Se solution (prepared initially as 4M Se dissolved in tri-butyl phosphine and then diluted with 1-octadecene) was injected. The nanocrystal growth was monitored by UV-Vis absorption spectroscopy and the reaction was quenched when the desired size was reached by an injection of 20 mL of butanol followed by cooling with compressed air.

After the synthesis, the nanocrystals were cleaned via a series of precipitations. First, the as synthesized nanocrystals were evenly divided among six centrifuge tubes. The nanocrystals were precipitated by adding a butanol/ethanol solution (50%_{v/v} butanol), until the nanocrystals flocculated. The nanocrystals were collected by centrifugation. After centrifugation, the supernatant was decanted; the remaining pellet of nanocrystals was dispersed in chloroform, and then precipitated by the addition of acetone. The nanocrystals were again collected by centrifugation. The supernatant was discarded. The chloroform/acetone washing step and centrifugation was repeated a second time, and after it was completed, the nanocrystals were dispersed in hexanes. Samples were stored in the dark until they were analyzed by electron microscopy to prevent photo-oxidation of the nanocrystal surface.

Electron Microscopy of CdSe Nanocrystals

The synthesis reported by Yu has been used without modification to synthesize cadmium selenide nanocrystals which have a dot morphology (a. X. P. W. William Yu, 2002). By altering the temperature of the reactive cadmium precursor at the time of the selenium injection we were able to synthesize nanocrystals with bi-pod morphology as shown in Figure 1 A and B. The bi-pod morphology is present when the cadmium oleate (the reactive cadmium precursor) is at 250 °C when the selenium solution is injected. While dots and rods are occasionally observed in these samples, they do not make up the majority of the sample as one would have expected. The morphology of the nanocrystals in the final product is entirely temperature dependent. When the temperature of the cadmium oleate is 310 °C prior to the injection of the selenium solution, the resulting nanocrystals have the more traditional dot morphology (Figure 1C). Studies are continuing to determine the exact temperature at which the morphology changes from bi-pod to dots. Preliminary results indicate that the transition occurs somewhere between 250 °C and 280 °C (Figure 1D).

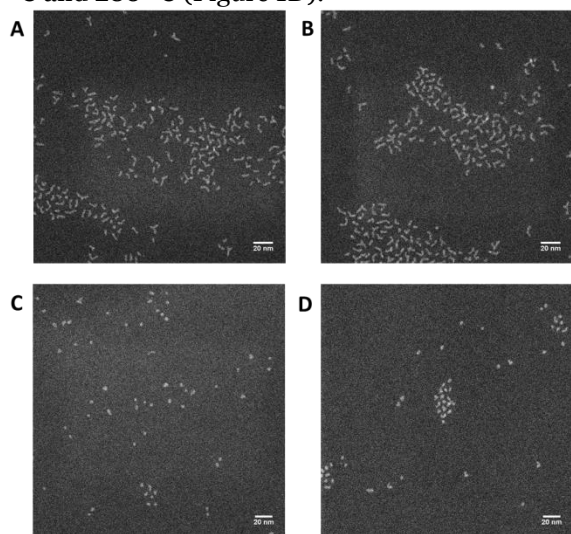


Figure 1. Electron Micrographs of nanocrystals synthesized with the selenium solution injected when the reactive cadmium precursor was at a temperature of (A) and (B) 250 °C, (C) 310 °C, and (D) 280 °C.

Previous studies have indicated that altering the alkyl chain length is a viable method for controlling the reactivity of the reactive cadmium precursor (Zheng Li, 2011). With this in mind, we explored shorter chain length carboxylic acids (hexanoic acid and trans 2-decenoic acid) to determine if the bi-pod morphology was unique to

oleic acid or if it was a general result of lowering the temperature of the reactive cadmium precursor when carboxylic acids are used as the surface passivating ligand. In the case of the hexanoic acid, the precipitation reactions necessary to clean the sample for electron microscopy resulted in the removal of a significant portion of the ligands resulting in the nanocrystals no longer being soluble. When the trans 2-decenoic acid was used, the ligand boiled away before it was able to convert the CdO into a reactive precursor. Thus, the question as to whether the bi-pods are unique to the oleic acid ligand remains unanswered.

When nanocrystals with dot morphology are synthesized, the band edge absorption peak can be used to determine the diameter of the nanocrystals (L. Q. W. William Yu, Wenzhuo Guo, and Xiaogang Peng, 2003). This is not the case with the resulting bi-pod structures because the electron-hole pair is not confined in every dimension. The sizing equation developed by Yu *et al.* is able to give a reasonably close estimate of the size of the confined dimensions of the bi-pod, however it is not exact. This is not unexpected since the model developed by Yu is applicable only to the dot morphology. As a result, it will require further study of the kinetics of the reaction to determine the rate at which the lengths of the bi-pods grow.

Conclusions

The temperature of the reactive cadmium precursor plays a critical role in determining the final morphology of CdSe nanocrystals. Injecting the selenium solution when the reactive cadmium solution is at a lower temperature results in a structure in which the electron-hole pair is not confined in all three dimensions. Our work indicates that temperature is a simple and effective means to manipulate nanocrystal morphology.

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Investigation of the Origin of the Diet Coke and Mentos Reaction

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Abstract — We investigate the origins of the popular Diet Coke and Mentos classroom demonstration. With video analysis, we measure geyser height and reaction time as a function of number of candies used as well as the temperature of the soda. Our results show that the maximum geyser height is linearly related to temperature over a broad range of temperatures. In addition, while exploring the parameter space we observed that the geyser process consists of two distinct steps.

Keywords — Demonstrations, Physical Chemistry, Solutions, Carbon Dioxide

Introduction

The addition of Mentos candy to Diet Coke as a classroom demonstration has become popular since it was widely publicized on an episode of MythBusters (Jack F. Eichler, 2007; "Soda and Mentos," 2006). It is widely known that the type of soda (diet versus regular) is an important factor in determining the height of the geyser. Furthermore, there are some indications that candy flavor matters (Coffey, 2008; "Soda and Mentos," 2006). We decided to study this reaction to better understand why Diet Coke seems to cause higher geysers than regular Coca-Cola. The commonly accepted explanation for this process is that the candies serve as a nucleation site for the outgassing of the carbon dioxide dissolved in the soda. Although the initial study was intended to better understand the variations based on soda choice and candy flavoring, we quickly realized that the underlying process is more complex than the simple "candy acting as CO₂ nucleation sites" explanation indicates. Thus, the focus of this work shifted towards developing a better understanding of the process of geyser formation, rather than our original goal of understanding the differences between soda types and candy flavors.

Experimental

Materials Needed

The following soft drinks and candies were utilized in measuring geyser height: Coca-Cola Classic, Diet Coke, Coke Zero, Mentos (mint, strawberry, green apple, and fruit). Expiration dates on the candy packaging were checked to ensure the freshest candies possible. Mentos that

were broken or had defects in the candy coating such as being cracked or crushed were not used. The following equipment was used for making measurements and data collection: Geyser Tube (available from www.geysertube.com), 50 mL burette, meter stick, portable video camera (Panasonic, SDR-T70), stopwatch, and a hot water bath.

Determination of Geyser Height and Reaction Speeds

A geyser tube was added to the top of the bottle to ensure a repeatable delivery of the Mentos candy. The tube was loaded with between 1-6 candies (depending on the number required for a given trial) and the geyser tube was screwed onto the mouth of the bottle. The geyser tube will fit 12 oz., 500 mL, 24 oz., and 2 L commercially available bottles. The bottle was placed a flat surface so that the mouth pointed directly upward. The string on the quick release was pulled allowing the candies to drop into the soda below. A camera was mounted onto a tripod to film the resulting geyser and the video was analyzed to determine the height of the geyser. All soft drinks were stored in a refrigerator prior to use. For trials at warmer temperatures the unopened soft drinks were stored in a hot water bath at the desired temperature until it reached thermal equilibrium.

High speed video data were collected by adding 1 to 6 Mentos candies (depending on the trial) to a 355 mL bottle of soda either at 5°C or 20°C with the geyser tube attached. The subsequent eruption was filmed on a stripped background at 480 frames per second, and measurements were made using a play back at 30 frames per second.

Results

Upon conducting trials, there are three trends which are easily noticed. The first trend is that the reaction is typically more vigorous, causing higher geysering when more candies are added. The second trend is that the height of the geyser correlates quite strongly with the temperature of the soda. The third trend is that bottle size also matters, with larger bottles generally having taller geysers. The results of the systematic examination exploration of the parameters of candy number and

temperature using 12 ounce bottles can be seen in Figure 1.

As can be seen on in Figure 1A, when the number of candies is small (1-3) increasing the candies increases the geyser height. However, adding further candies (4-6) has little effect on the geyser height, indicating that the reaction has reached some sort of plateau. Another feature evident in this graph is a sizeable variability in the geyser heights, especially at the warmer temperatures. The geyser process is chaotic. Occasionally, a trial will be somewhat higher than expected. Likewise, it sometimes happens that a trial will drastically underperform as easily apparent in the 5 candies trials. From a practical perspective for those performing this as a demonstration, it is not necessary to add an entire roll of 14 candies to achieve the maximum geyser height. Adding 5 or 6 candies is usually sufficient.

Figure 1B shows the relationship between the maximum geyser height and temperature. The most remarkable feature of this Figure is how strongly linear this relationship seems to be over the range of temperatures that were studied. As will be discussed below, the underlying physical process responsible for the geyser is rather complex, thus there is no *a priori* reason to believe that the temperature/height relationship ought to be linear over any sizeable range. Also, it should be noted that we expect that there is likely a plateau point with the temperature, at which higher temperatures do not cause taller geysers.

By analyzing the video footage, we were also able to determine how fast the reaction occurred, which is seen in Figure 2 (A) and (B). As can be clearly seen, the warmer the soda, the faster the reaction occurs. In addition, the faster the reaction occurs, the higher the eventual height of the geyser.

Discussion

As previously mentioned, the geyser process is more complicated than the simple initial notion that the geyser is entirely the result of the candy providing CO₂ nucleation sites. First, the candies are not absolutely necessary as vigorous mechanical agitation can also cause a geyser-like effect. Rapidly shaking and then immediately opening any carbonated beverage is likely to cause the liquid contents to gush forth in a foamy mess. Indeed, Baur has demonstrated the geyser effect by placing soda bottles into a sonicator bath (John E. Baur, 2006). Upon initiating the sonication, the soda will geyser out of the bottle exactly like adding the candies.

Second, the correlation between height and temperature cannot be readily explained given just

simple bubble nucleation at the candy surface. The average number of nucleation sites on the surface of a candy is not dependent on the temperature of the soda. Rather, it is the ability of the liquid to outgas more quickly and efficiently at higher temperatures which causes the geyser height to increase as temperature increases. Lastly, the high speed video footage shows the foam erupting from the bottle will actually accelerate for a time as it moves upwards. It is very clearly a complex fluid dynamics system.

It is our contention that the geyser process is really the combination of two distinct effects. The first effect is the visually obvious formation of bubbles at the candy surface as is commonly accepted. The second effect is one in which the mechanical agitation of the liquid caused by the rising bubbles causes additional CO₂ outgassing. It is this secondary mechanical outgassing that is responsible for most of the height famously associated with this process.

Conclusions

Our observations indicate the geyser process is a more complicated process than is generally presented to students during the demonstration. Simple explanations, such as Henry's Law or bubble nucleation, are insufficient to explain the relationship between geyser height and temperature. We have proposed a two-step process which better explains the origin and relationships responsible for the geyser upon addition of the Mentos candies.

Acknowledgments

We would like to thank Jamie Hyneman, Adam Savage, and Beyond Productions for providing high speed video footage of the geyser process.

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Figures

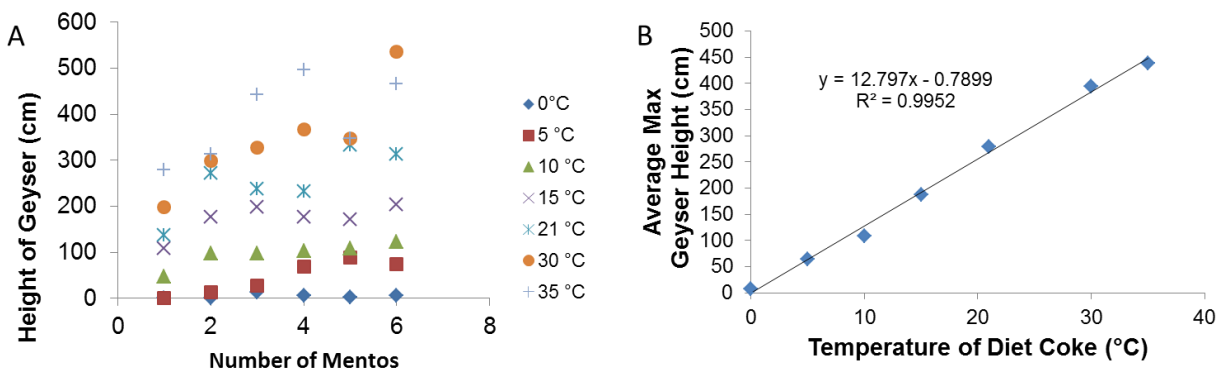


Figure 1. (A) The trend between number of candies and geyser height, and (B) the linear relationship between the temperature and the maximum height is shown. In all measured samples Strawberry Mentos and 355 mL bottle of Diet Coke were used.

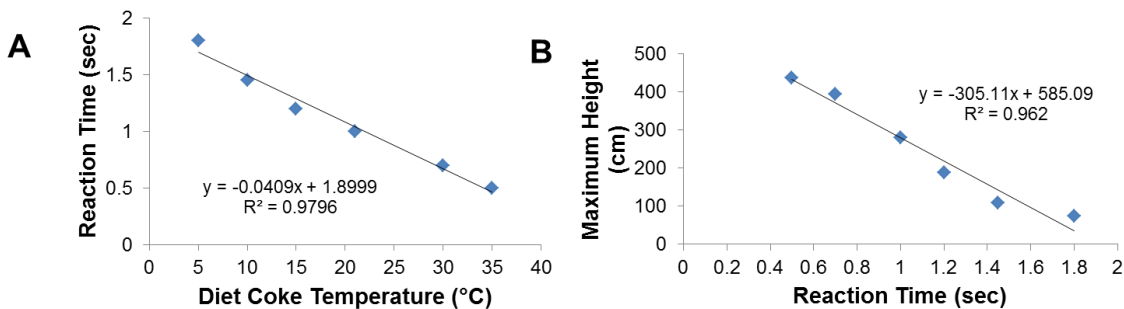


Figure 2. (A) The linear relationship between the temperature of the soda and the reaction time is shown, and (B) the linear relationship between the reactions time and the maximum height is shown.

An Improved Synthesis of an Alkynyl-Bacteriochlorin

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Abstract- *The use of photodynamic therapy (PDT) as a viable treatment for cancer has been hindered by the many limitations of the photosensitizers used in this therapy, including solubility in biological fluids, weak absorbance at clinically useful excitation wavelengths (NIR), and selectivity. Recently, carbohydrate-bacteriochlorin conjugates (CBCs) have gained attention for their ability to address several of these shortcomings. Advances in the development of a concise route for the synthesis of brominated bacteriochlorins have allowed for the development of alkynyl-bacteriochlorin derivatives that can be utilized in 1,3-dipolar cycloaddition reactions to produce the aforementioned CBCs. As part of our ongoing efforts to generate CBCs, we report an improved synthesis of an alkynyl-bacteriochlorin using the Sonogashira reaction.*

Keywords- Photodynamic therapy, carbohydrate-bacteriochlorin conjugates (CBCs), alkynyl-bacteriochlorin, Sonogashira.

Introduction

Photodynamic therapy (PDT) has gained popularity as a viable and noninvasive alternative to surgery, radiation therapy and chemotherapy in the treatment of solid cancers of the head and neck, brain, lung, breast, prostate, pancreas, skin and intraperitoneal cavity [1]. Photodynamic therapy involves administering a photosensitizer via intravenous or intraperitoneal injection to the patient. Following a period of time necessary to maximize the differential uptake of the photosensitizer between neoplastic and healthy cells, the area of the body containing the tumor is irradiated with specific wavelengths of visible or near-infrared light. This results in the production of reactive oxygen species (ROS) and other reactive intermediates that destroy the tumor [2]-[6].

Despite the progress that has been made in the design and development of PDT photosensitizers, there are still several major shortcomings [7]. First, the majority of photosensitizers, such as Photofrin (porphyrin based), are nonpolar aromatic compounds that exhibit very poor solubility in biological media (water), causing aggregation and ultimately a reduction in the ROS produced. A second major limitation is weak absorbance at clinically useful excitation wavelengths (near-infrared, NIR), preventing the treatment of deep seeded tumors and sizeable lesions [8]-[10]. A third

limitation is limited selectivity, which may lead to the damage and destruction of healthy cells.

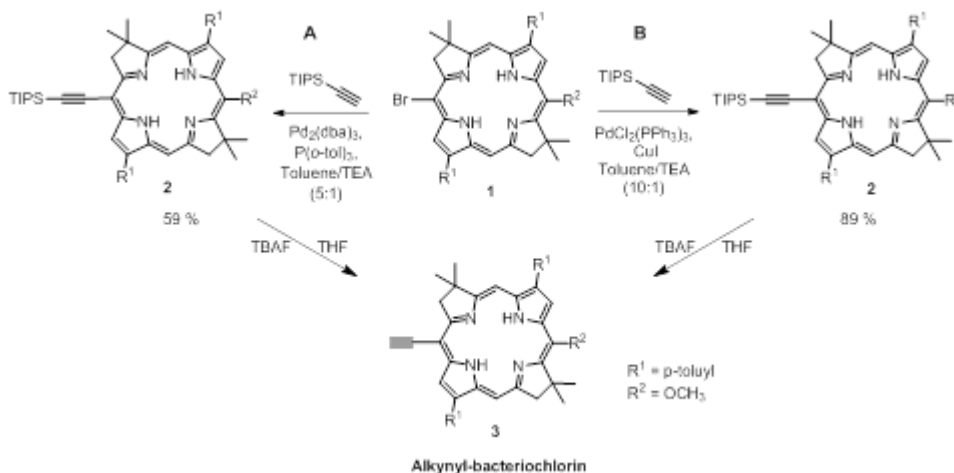
Bacteriochlorins, an aromatic hydrocarbon (a close relative to porphyrins) which absorbs in the NIR between 700-800nm, have shown significant promise as next generation photosensitizers [11]. While solubility and selectivity issues continue to remain problematic with this class of compounds, bacteriochlorin conjugation to water soluble molecules such as carbohydrates can be used to obviate these challenges. In addition to imparting solubility in biological media (water), carbohydrate ligands can be designed to bind specific proteins involved in tumor transformation and metastasis. The resulting carbohydrate-bacteriochlorin conjugates (CBCs) could be considered a new class of selective photosensitizer with direct applications as a photosensitizer for PDT.

In the past twenty-five years only two examples of carbohydrate-bacteriochlorin conjugates (CBCs) have been reported [12]-[13] and of those examples only one report provided limited data on the potential of these compounds to serve as photosensitizers [13]. Therefore, significant work remains in order to realize the full potential of this class of compounds. One major factor limiting progress in this area is the lack of a modular synthetic approach for the rapid and high yielding synthesis of CBCs bearing different carbohydrate ligands. One possible method of generating CBCs is through Cu(I)-catalyzed azide-alkyne 1,3-dipolar cycloaddition reaction which involves the coupling of an azido-carbohydrate and an alkynyl-bacteriochlorin.

Recent advances in the development of a concise and high yielding route for the synthesis of brominated bacteriochlorins [14]-[18] has allowed for the development of alkynyl-bacteriochlorin derivatives that can be utilized in 1,3-dipolar cycloaddition reactions to produce the desired CBCs for future study. Of the known pathways for synthesizing alkynyl-bacteriochlorins, Sonogashira cross-coupling methodologies which employ a palladium catalyst to form a carbon-carbon bond between a terminal alkyne and an aryl halide, presents an attractive and potentially high yielding approach.

Results and Discussion

A synthetic protocol first reported by Lindsey and co-workers was used to access the bromo-bacteriochlorins of interest for our alkylation studies [14]-[18]. Alkylation of bacteriochlorin **1** is illustrated in Scheme 1 with two competing strategies highlighted, Heck Alkylation (Scheme 1A) and Sonogashira (Scheme 1B). Brominated bacteriochlorin can be used to synthesize the “protected” alkylation-bacteriochlorin **2** through either the Heck alkylation or Sonogashira cross coupling reactions. The former (Heck alkylation, Scheme 1A), previously reported by Lindsey and co-workers [18], resulted in a 59% yield. Our use of Sonogashira cross-coupling (Scheme 1B) to produce **2** resulted in an 89% yield (average of 86%, 3 trials). Finally, deprotection of the triisopropylsilyl group under standard conditions gives the desired alkylation-bacteriochlorin **3**.



Scheme 1. Alkynyl-bacteriochlorin synthesis via Heck cross-coupling [18] (A) and Sonogashira cross-coupling [19] (B) methodologies.

Previous attempts to synthesize alkylation bacteriochlorins avoided the Sonogashira reaction, a well known alkylation reaction, due to the use of CuI as a co-catalyst. Under conditions used by most metal-catalyzed cross-coupling reactions, certain metals with relatively small atomic radii such as copper have the tendency to metalate or chelate with porphyrin (a close relative to bacteriochlorins), thus removing the catalyst from the system and reducing catalytic efficiency and yield. However, bacteriochlorins are not as susceptible to metalation under these conditions [22]. We have shown that Sonogashira cross-coupling can be used effectively for alkylation of bacteriochlorins and demonstrates an improvement over previously published strategies.

Conclusion

Utilizing the Sonogashira reaction, we report an improved synthesis of alkylation-bacteriochlorins that surpass the reported yields of the Heck alkylation strategy [18]. Due to the 50% increase in yield of bacteriochlorin **2** utilizing the Sonogashira approach, we have improved the overall yield of this 14 step synthesis by ~0.5% (a noteworthy improvement considering the number of synthetic steps). We are currently investigating the use of alkylation-bacteriochlorin in Cu(I)-catalyzed azide-alkyne 1,3-dipolar cycloaddition reactions with azido-carbohydrates to generate the desired CBCs. Determination of the pharmacokinetic and phototoxic properties of these CBCs is of future interest.

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Using FT-IR Spectroscopy to Measure Glucose Concentrations

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Abstract — *ATR FT-IR Spectroscopy was used to measure the concentration of glucose in aqueous samples including ones mixed with artificial tears to mimic the composition of the intraocular fluid. The vibrational modes of glucose in the region 980–1200 cm⁻¹ are exploited as identifiers of the concentration of the glucose. The transmission, at the two peaks (1030 cm⁻¹ and 1078 cm⁻¹) chosen for analysis, is proportional to the concentration of the glucose in the sample. At concentrations above 90 mg/dL this method appears to be a valid technique to measure the concentration of glucose in aqueous solutions with a sensitivity of 20 mg/dL. At concentrations under 90 mg/dL, the method produced reproducible values; however, due to scaling in the FT-IR Spectrometer itself, the method is currently not reliable in determining the low concentrations of the glucose.*

Keywords — FT-IR, Spectroscopy, Glucose

Introduction

The CDC reports that 25.8 million people in the United States have been diagnosed with diabetes; this is 8.3% of the population. Control and monitoring of blood glucose levels by the patient in order to keep these levels in the prescribed target range is a vital requirement for disease management. This practice can be a deterrent for some patients due to physical discomfort and costs. With the current technology, using finger sticks and test strips, the patient makes several daily checks. However, the best approach would be nearly continuous monitoring which would then indicate medication or activity adjustments needed by the patient. For these reasons the development of a noninvasive method using optical sensors offers and attractive course of action.

Measuring blood glucose noninvasively by both direct and indirect methods has been researched for approximately two decades (Arnold and Small, 2005). Such methods include NIR (near infrared) Raman Spectroscopy (Lambert, Morookian, Sirk and Borchert, 2002; Lambert, Pelletier, and Borchert, 2005), Optical Coherent Tomography (Larin, Motamedi, Ashitkov, and Esenaliev, 2003; Esenaliev, Larin, and Larina, 2001), NIR Diffuse Reflectance (Malin, Ruchti, Blank, Thennadil, and Monfire, 1999), and NIR Transmission Spectroscopy (Burmeister and Arnold, 1999). These noninvasive methods sample the glucose

levels either through the skin (Burmeister and Arnold, 1999; Malin, Ruchti, Blank, Thennadil, and Monfire, 1999) or in the aqueous humor of the eye (Lambert, Morookian, Sirk and Borchert, 2002; Lambert, Pelletier, and Borchert, 2005). FT-IR (Fourier transform infrared) Spectroscopy focusing in the mid-infrared region has been used to measure blood glucose levels through invasive sampling techniques, which draw and analyze whole blood (Shen, Davies, Linfield, Elsey, Taday, and Arnone, 2003). Scott et al. used FT-IR to measure glucose levels in saliva in the near infrared region (2010) whereas Sultana, Zafarullah, and Kirubamani used this technique in the near and mid-infrared regions (2011). This project combines the use of ATR (Attenuated Total Reflectance) FT-IR Spectroscopy and noninvasive sampling in the mid-infrared region.

D-Glucose or Dextrose monohydrate is a simple molecule with the chemical formula of C₆H₁₂O₆ yet determining the concentration in blood using optical methods is complex. This molecule has signature vibrational modes in the infrared region of the electromagnetic spectrum. These vibrational bands allow for spectral identification of the molecule. In the region of interest 980–1200 cm⁻¹, these spectral peaks are attributed to the C-O stretch in the glucose molecule.

Procedures

A Varian 640-IR FT-IR Spectrometer was used to measure the spectra of the samples. Agilent Resolutions Pro software controls the spectrometer as well as acquires and processes the data. Each 20 μL sample was placed in a PIKE MIRacle™ ATR Single Reflection (19440) ZnSe plate. 16 scans with a 4 cm⁻¹ resolution were averaged to produce each created spectra. The spectra were taken in the mid-infrared region between 980 – 1200 cm⁻¹ (see Figure 1). This region contains spectral peaks of glucose at 1030 cm⁻¹ and 1078 cm⁻¹ while avoiding the main part of a broad water band; however, the 1030 cm⁻¹ peak is in the outer wing of the water band. The spectra was then transferred to EXCEL where the transmission at the peaks were recorded for each concentration. The transmission was plotted as a function of concentration, which serves as a calibration curve (see Figure 2).

A 1000 mg/dL glucose concentration sample was created by mixing 1000 mg of Sigma D-(+)Dextrose (D9434-500G, Batch 055K0141) in 1 dL of water. This sample was then diluted in either water or water combined with 50 μ L artificial tear solution to create 1000 μ L samples ranging in concentration from 50 – 900 mg/dL. The artificial tears used were Blink®Tears by Abbott Medical Optics, which contain Polyethylene Glycol 400, Boric Acid, Calcium Chloride, Magnesium Chloride, Potassium Chloride, purified water, Sodium Borate, Sodium Chloride, and Sodium Hyaluronate. This solution does alter the spectra, but does not mask the glucose peaks. The artificial tears are used to mimic the intraocular fluid, which is a possible site to measure glucose levels. All volumetric measurements were made with a Finn micropipettor.

Before the spectra of the glucose samples are taken a background and a water sample spectra are created for references. Between each sample the ZnSe plate was rinsed with water and wiped clean with an optics cloth to avoid cross-contamination of the samples.

Results

As seen in Figure 1, the transmission values vary for the glucose peaks at various concentrations both in water and in water mixed with the artificial tears. When the transmission is plotted as a function of concentration at higher concentrations (90-1000 mg/dL), there is a linear relationship which occurs regardless of the peak, 1030 or 1078 cm^{-1} , analyzed (see Figure 2). At low concentration (50-90 mg/dL), the plot, (see Figure 3) is no longer linear. This non-linear phenomenon is attributed to the Agilent Resolution Pro software scaling routine. This was verified by running various concentration samples of methanol, which has a strong peak (1015 cm^{-1}) in the region of interest. As in the glucose samples, at high concentrations the transmission of the methanol peak is linear with respect to concentration, and at low concentrations the relationship is non-linear and has the same profile as the glucose samples. The linear fit at the higher concentrations is reproducible. Differences of 20 mg/dL glucose concentrations are detectable using this method.

Conclusions

Using an FT-IR Spectra in the mid-infrared region produced reproducible and reliable quantification of the glucose concentrations in aqueous samples at concentrations varying from 90 mg/dL to 1000 mg/dL. At concentrations less than

90 mg/dL a scaling technique in the Agilent Resolution Pro software appears to create an aberration in the data. Eliminating this scaling issue is being investigated with the hope that if it is eliminated, the linear relationship between transmission values at the vibrational peaks and concentration can be extended into low concentrations.

Acknowledgements

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Figures

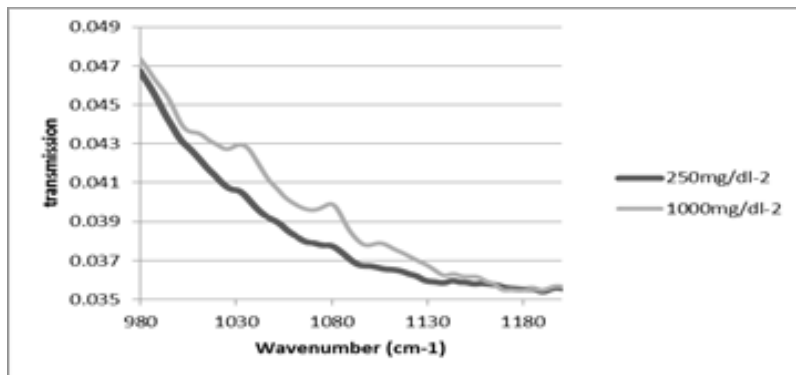


Figure 1: FT-IR Spectra of 1000 mg/dL and 250 mg/dL glucose samples

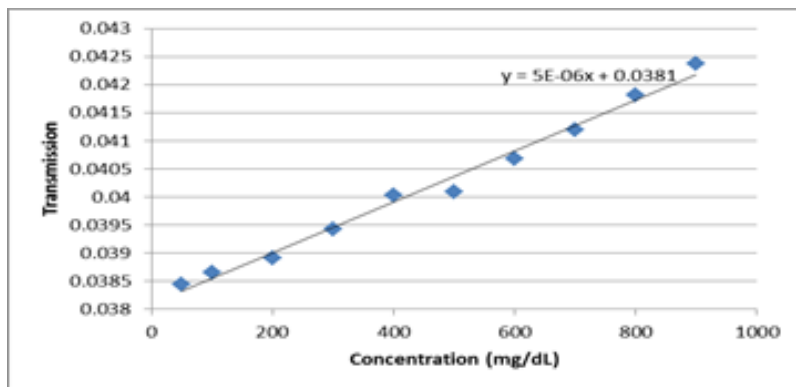


Figure 2: Transmission as a function of glucose concentration (90-900 mg/dL)

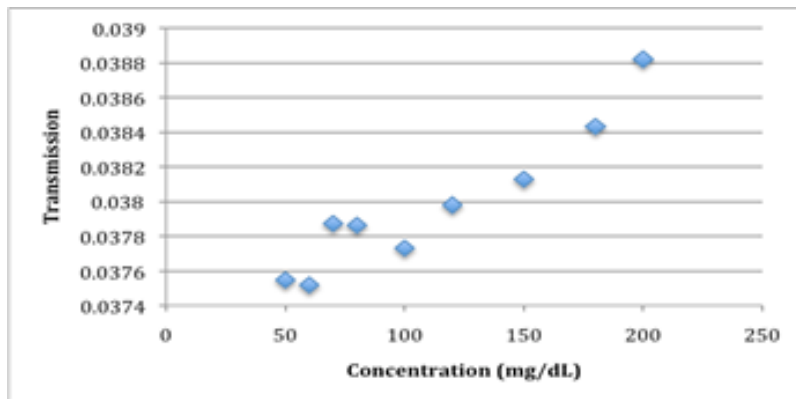


Figure 3: Transmission of glucose at low concentrations

Study of Rockett atomic potential for CdTe semiconductor compound

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Abstract – The growth simulations for CdTe compounds using Rockett potential are performed. Since the success of the simulations depends on the correct selection of the Rockett parameters, the primary interest of this work is to find the optimal Rockett parameters. The Rockett parameters for SiTe are adjusted through the fitting method in which the Rockett potentials for two different structures are to fit the potentials obtained from the pseudopotential density functional theory (P DFT) method. The epitaxial growth and interface configuration from the growth simulations using the implemented Rockett parameters are accorded with experimental results.

Keywords – CdTe/Si, Molecular dynamics simulations, epitaxial growth

Introduction

The present work is related to the development of monolithic IR detectors based on HgCdTe. Since direct growth on Si is not possible, it is practical to put CdTe buffer layers between the HgCdTe and Si. The potential use of Si is very desirable because Si substrate are transparent in the IR and can be coupled to Si readout electronics [1]. Growth of such epilayers on Si substrates by means of molecular beam epitaxy (MBE) critically depends on substrate quality, orientation, and growth conditions.

Since the initial growth determines the quality of subsequent growth, the initial nucleation process and the interface configuration of CdTe on Si is crucial for improving both the quality and its potential device performance. In the study of the optimal atomic configuration of the interface and description of the initial growth of CdTe/Si using the numerical simulations, molecular dynamics (MD) simulation describing the initial kinetic behavior of deposited adatoms is performed and the optimized interface configuration is obtained through total energy minimization of the structure. To calculate interatomic interactions for the energy minimization, Rockett potential is employed [2]. The results from the growth simulations are compared with experiment. The results of the simulations are critically depended on the employed potential form and potential parameters. Since the results of the growth simulations greatly depend on the trajectories of moving atoms, the

accuracy of the employed interatomic structure is crucial. The accuracy and transferability of the chosen potential and kinetic parameters allow one to reproduce the optimized atomic configuration and expected kinetic processes in agreement with experimental observations.

The object of this paper is to test the Rockett potential's applicability for the nucleation and deposition near interface and at step edges between two different semiconductor compounds, CdTe on Si. The success of the growth simulation greatly depends on the right choice of the Rockett parameters.

Rockett Potential

Rockett potential is modified from the Tersoff potential to avoid the abrupt cutoff that causes the anomalous behavior of atoms on the Si surface by giving smooth cutoff distances and broad interaction ranges. Before full discussion for the Rockett potential, Tersoff potential will be discussed first. Tersoff realized that the strength of each bond with many neighbors is weaker than an atom with few neighbors. He developed a pair potential the strength of which is determined according to the local environment. Since pair potentials are unsuitable for describing covalent systems, Tersoff abandoned the use of N-body potential form, but utilized the Morse-type tail used in two body potential that is suitable for a multi neighboring environment because it has a stable harmonic well at equilibrium caused by short range repulsion and smooth tail incorporating various configuration with long range attractive tail. He proposed a new interatomic potential in which environment dependent bond order explicitly coupled with coordination number, the number of neighbors close enough to form bond.

Rockett modified the Tersoff potential by adding the cutoff function to the attractive term in order to describe the intermediate interatomic distance accurately. Rockett cutoff distances are introduced to extend the potential range accuracy beyond the observed bond length. The strength of Rockett potential is that it has many parameters to incorporate various local environments, but it would be also its disadvantage because searching

many optimal Rockett parameters is a challengeable task computationally.

In this paper, the transferability and applicability of the employed Rockett potential are tested through the growth simulations CdTe/Si system with a wide variety of local environment.

Obtaining the accurate hysteresis curve for the bulk CdTe is a gateway to the success of the growth simulations. The results obtained through the simulated annealing using the Rockett parameters for the CdTe bulk is a gauge for the successful growth simulations because the melting and freezing involve significant variations in bond angle. The Rockett parameters for CdTe bonds are adjusted to give the experimentally determined cohesive energy, lattices constant, and bulk modulus for zinc blende bulk CdTe. All other parameters are chosen to reproduce the observed melting temperature, 1365 K [3]. The hysteresis curve that obtained using the optimal parameters is shown in Fig. 1.

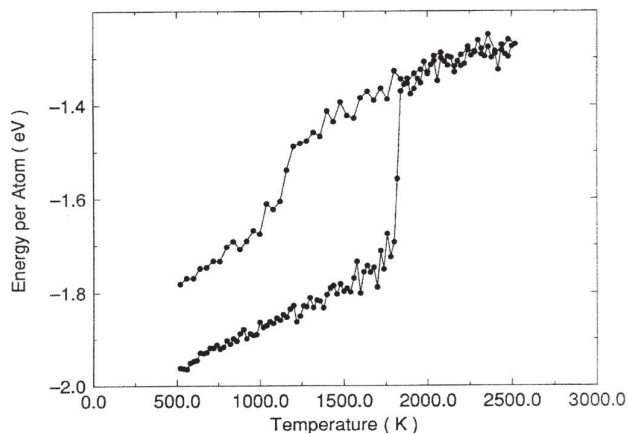


FIG. 1: Simulated Annealing Hysteresis curve for bulk CdTe.

Search for Si-Te Rockett Parameters

Among six possible bonds in the structures: SiSi, CdTe, SiTe, CdCd, TeTe, SiCd, , the Si-Te and Cd-Te bonds are the most important bonds for the nucleation and its subsequent growth because the Rockett parameters for SiSi are well established[2] and the parameters for CdCd and TeTe, and SiCd bonds are less important in nucleation and initial growth.

The most critical bond for nucleation and surface reconstruction, and configuration at step edges is Si-Te bond. The Rockett parameters for Si-Te are crucial in the growth simulations because it is observed that incoming Te atoms start the growth process by forming SiTe bonds, and the interface configuration is largely determined by the Si-Te interactions. Since bulk SiTe does not exist in

natural compound, the Rockett potentials for bulk zinc blende and BCC Si-Te at the two different equilibrium distances are obtained using the pseudopotential density functional theory (PDFT) method.

Growth Simulations and Results

In this paper the growth simulations using 216 atoms with periodic boundary condition for the CdTe on Si (001) are performed. The expected growth direction of CdTe in epilayer would be [111] direction. The Rockett potential using the implemented Rockett parameters is tested in the interface configuration and epilayer growth for the CdTe.

Epitaxial growth simulations for CdTe/Si super cell (SC) with single layer step, called SL SC, are performed. Each dot in the Fig. 2 is the positions of an atom projected onto a plane perpendicular to [110] during the equilibration process after the arrival of all deposited atoms. The atomic position of the lowest atomic layer is not shown in the Fig. 2. The dashed lines represent the surface of the substrate and 2×1 surface reconstructions are visible just below these dashed lines. Experimental images by scanning tunneling microscopy (STEM) for the structures of Cd(111) on Si(001) were obtained by Wallis et al.[4] and shown in Fig. 3.

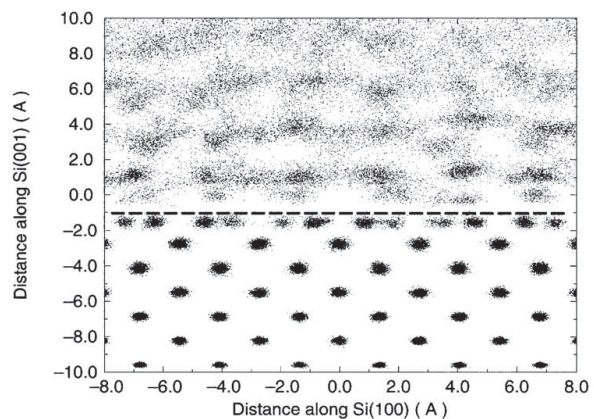


FIG. 2: Pictorial representation for epitaxial growth simulations of CdTe on Si(001) from the direction [100] through pure molecular dynamics simulations.

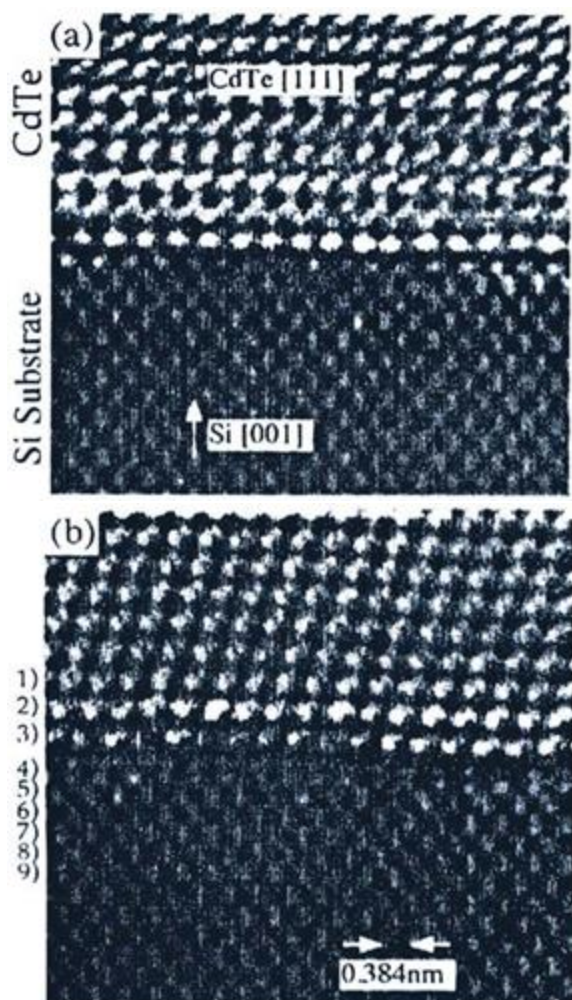


FIG. 3: STEM images for MBE grown CdTe(111) on Si(001) as observed[4].

Conclusion

In this work, the feature of Rockett potential is studied. Since the success of the growth simulations critically depend on the the Rockett parameters, the optimal Rockett parameters are extensively searched, especially for the SiTe Rockett parameters. The growth simulations result implemented by Rockett parameters show good transferability to various local environments and promising applicability to the more complex compound.

Acknowledgement

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Culturally Relevant Strategies for Supporting American Indian Entrepreneurship

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Abstract — *Any discussion of Native American entrepreneurship is incomplete without addressing the issue of culturally appropriate entrepreneurship development strategies. Native American entrepreneurship development strategies will not succeed without taking the differences between Native and non-Native cultures into account. The complexity of and differences among tribal cultures also must be considered. General differences between Native and non-Native cultures need to be recognized and incorporated into culturally relevant entrepreneurship development strategies. This paper will provide a cursory overview of such strategies that can be leveraged to support and sustain Native small business development and entrepreneurship.*

Keywords — Business strategy; entrepreneurship; American Indian

Introduction

Providing support for micro-enterprise, small business development, and entrepreneurship in Indian Country has been the subject of much discussion in recent years, and there is some debate as to the services such enterprises need to be successful. Research suggests that Native entrepreneurs confront several barriers in developing small businesses (Adams and Pischke, 1992; OECD 1994; OECD 1998; Aspen 2000c). Among the most frequently cited are: 1) limited access to credit and financial capital, 2) a lack of information and knowledge as to how best to use resources, and 3) a lack of networks or peers who can provide support (Shorebank Advisory Services, 1995). Inadequate demand for products as well as limited labor skills have also been noted (OECD, 1994).

In general, issues of financing, a lack of business expertise, and limited tribal support are important (Garsombke and Garsombke, 1998; Lansdowne and Bryant, 1999; Pavel and Timmons, 1996). A study of Native entrepreneurs in Minnesota and Wisconsin found, for instance, that “aspiration” level, lack of formal business education, and lack of access to financial resources were rated as significant barriers to start-up businesses (Garsombke and Garsombke, 1998). Discrimination was also perceived as a factor as

well. A series of interviews with Native entrepreneurs conducted by Lansdowne and Bryant, indicated that 1) the availability of start-up capital, 2) the presence of partners or mentors to provide support, and 3) the role of tribal government codes and ordinances to provide a supportive regulatory environment to the small business sector were critical factors in business success (Lansdowne and Bryant, 1999). Central to uncovering the challenges of entrepreneurship and economic development in rural Native communities is understanding the economic and cultural context in which Native entrepreneurs live and operate their businesses.

Understanding the Centrality of Cultural Context

Any discussion of Native American entrepreneurship is incomplete without addressing the issue of culturally appropriate entrepreneurship development strategies. More than 20 years of study by the Harvard Project on American Indian Economic Development revealed that one of the three components that underlie Indian nations’ ability to build sustainable economies is “institutions that operate consistently with indigenous beliefs about how authority should be organized and exercised (cultural match)” (Harvard Project for American Indian Economic Development, 2000). (The other two factors, sovereignty and capable governing institutions, are touched on in the policy section of this report.) There is still some debate about the cultural appropriateness of individual entrepreneurship (versus tribally owned enterprises) in Native American economic development strategies (Flora, C., & Bregandahl, C., 2002). However, available research and interviews confirm that tribal elders and policymakers, economic development practitioners, and researchers believe that individual entrepreneurship is compatible with past and present Native culture and can be an important vehicle for expanding tribal economic sovereignty.

Underlying this general agreement, however, is the acknowledgement that Native American

entrepreneurship development strategies will not succeed without taking the differences between Native and non-Native cultures into account. The complexity of and differences among tribal cultures also must be considered. Native Americans are not a homogenous group and do not hold the same values. Still, general differences between Native and non-Native cultures need to be recognized and incorporated into culturally relevant entrepreneurship development strategies. CFED's interviews and analyses of available research on cultural perceptions of Native entrepreneurship revealed the following initial considerations:

The issues of control and use of assets are critical in any Native entrepreneurship development strategy. Tribes own lands rich in resources, such as timber, range and crop land, oil and gas reserves, uranium deposits, and water reserves, yet most tribes and individual Native Americans have little or no use of or control over their own assets (Adamson, 2001). Because much of the land on Indian reservations is held in trust by the federal government, either for the tribe or for private families, it is difficult for aspiring entrepreneurs to use their trust land as collateral when working with banks to gain access to credit. And because of flawed accounting by the federal government, many individuals with trust land do not have a clear accounting of the land they own. Educating tribes and individuals about regaining control and/or using their assets is critical to any effort to promote entrepreneurship in Native American communities (Deweese, 2001).

Native Americans have had a long history of individual entrepreneurship, which continues today. Despite general misperceptions that Native culture (past and present) is not consistent with private entrepreneurship, Native peoples have had a long history of engaging in trade and commerce. The traditional Native American model of entrepreneurship differs from mainstream models in that it acknowledges and encourages the role of trade and individual product development while respecting the preservation of natural resources (Miller, 2001).

This remains true for many Native entrepreneurs today, who note that Native American business models value sustainable utilization of natural resources over profit (Flora & Bregandahl, 2002). While Native entrepreneurs may vary in their incorporation of traditional tenants, all of them play an increasingly important role in diversifying the economic base of local rural economies.

For many Native Americans, entrepreneurship is about utilizing individual initiative to benefit the whole community. In many Native communities,

entrepreneurship has a broader meaning than mainstream definitions, such as "the process of growing and creating an enterprise for personal economic gain." As noted by Johnnie Aseron, founder of the social entrepreneurship venture Rediscovering the Seventh Direction, entrepreneurship means, "having the boldness and insight to begin something new and recognizing one's strengths and abilities as well as the abilities of others in order that the entire community may benefit." (Meeks, 2007). To some, a Native entrepreneurship development strategy means emphasizing the role of cooperation, valuing group goals, and placing material success after emotional, family, or community relationships. This includes taking the time to receive feedback on plans or ideas not only from a board of directors or business mentor, but also from tribal elders and the larger community. On the other hand, this community-oriented approach creates discomfort for some Native entrepreneurs. They sometimes feel uneasy about as the appearance of "having something," as it is sometimes met with jealousy or resentment from the community. As noted by Elsie Meeks, Native entrepreneur and advocate, "contributing to the community is part of doing business for us, but people also need to recognize that they must give from their net profits, not their gross, if they want to survive in the long run."

Native entrepreneurship development is a holistic strategy. According to many interviewed for this report, Native and non-Native American cultures "conceptualize" differently. While non-Native cultures may conceive in a more segmented and linear fashion, Native cultures think and plan holistically. They often take into account personal or community issues that may not be perceived by others as directly related to entrepreneurship development (Harvard Project for American Indian Economic Development, 2000). A recent survey of Native and non-Native American entrepreneurs quantitatively documented this difference, finding that a greater percentage of Native American entrepreneurs identified themselves as "subjective thinkers" or as people "thinking with their hearts," whereas non-Native entrepreneurs saw themselves more often as objective thinkers (Garsombke and Garsombke, 1998). According to some, this difference in thinking, combined with the current state of poverty and its accompanying social ills on reservations nationwide, means entrepreneurship development programs may need to employ holistic strategies that deal with both personal and economic empowerment. This is not to say that Native American business development programs should not assist entrepreneurs with careful analysis of market demand, business plans, and

financial management. Rather it means that that simply implementing a model focused solely on linear business development techniques into Native American communities will not necessarily be well received or effective.

Native Americans who live and work on reservations often have very little experience working in, managing, or owning businesses. Whether it is due to a lack of political, economic, or social support for reservation-based entrepreneurs, industry leaders convey that many Native Americans lack exposure to or experience in business, and are therefore hesitant to pursue or follow through on entrepreneurship opportunities. A recent report that examined differences between Native and non-Native American entrepreneurs in Minnesota and Wisconsin found that only 13% of Native American have parents who are entrepreneurs compared to 75% of non-Native American entrepreneurs (Garsombke and Garsombke, 1998). Without a strong base of existing businesses on reservations or support from role models, aspiring Native entrepreneurs lack opportunities to gain experience in or be exposed to entrepreneurship. In many cases, Native Americans feel marginalized and convey the feeling of being “left behind” and needing to “catch up with the rest of the world.” (Flora & Bregandahl, 2002).

Conclusion

Overall, the primary conclusion to be drawn from this work is that entrepreneurship development has the potential to contribute positively to wealth creation, economic development, and poverty alleviation and can be compatible with Native traditional cultures. However, there are myriad barriers in Native communities—political, attitudinal, financial, legal, and informational which compound the normal challenges of trying to foster successful entrepreneurship in the rest of rural America.

Despite the clear need for increased investments in entrepreneurship development for Native communities, an inadequate network of support exists for Native businesses, particularly new business startup. Mainstream economic development programs or nonprofit organizations largely overlook opportunities to strategically support Native entrepreneurs yet there are creative public-private partnerships that are emerging to better support them. Tribal elders, Native and non-Native policymakers, economic development practitioners, and researchers posit that culturally

appropriate entrepreneurship is not only compatible with Native culture (past and present), but can and should serve as a vehicle for expanding tribal economic sovereignty and reducing poverty among Native peoples.

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The Economic Impact of Hunting in South Carolina

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Abstract — *Hunting and hunters have a significant economic impact on the national and state economies by generating financial support to create thousands of jobs directly involved in the manufacture, sale or provision of hunting and outdoor products and services. This impact is particularly important to South Carolina. This paper will examine the economic impact of hunting on the South Carolina economy.*

Keywords — Economic development; outdoor recreation; hunting

Introduction

Many Americans are not aware that North American wildlife, woods, and waters have been managed, conserved, and protected for decades primarily because hunters have pushed for it—and helped pay for it. In 1938, Congress created the Pittman-Robertson/Wildlife Restoration federal aid program. In 1950, federal lawmakers followed up with the Dingell-Johnson/Sport Fish Restoration program. Since then, federal taxes on sporting goods created by these laws have provided \$9.5 billion for state-based wildlife conservation. This highly successful conservation model has made possible the restoration and management of deer, turkey, game fish and a host of other game animals, many of which have come back from severe depletion around 1900 to record abundance today. By focusing on the habitat that sustains all wildlife, hunter-driven conservation has also benefited threatened and endangered species and nongame animals. It is only recently that non-hunters have come to appreciate the environmental and economic impact of hunting.

The U.S. Fish and Wildlife Service (USFWS) 2011 National Survey of Fishing, Hunting and Wildlife-Associated Recreation reports 13.7 million people aged 16 or older (approximately 6 percent of the United States population) went hunting that year and spent \$38.3 billion on equipment, licenses, trips and hunting related expense. That is a per-person expenditure of approximately \$2,800 per hunter. And these estimates are conservative. There are approximately 2 million more hunters under the age of 16 for whom a parent or guardian likely spends on their behalf. Plus, state hunting license records show some hunters unable to renew their license in one year will return the next. Thus,

the true number of people who hunt annually in the United States is likely closer to 16 million, and their total expenditures are arguably even higher.

The money these sportsmen spend nationally helps create and support more than 680,000 jobs at a time when unemployment has hovered at near-historical highs. In some rural communities, the dollars brought in during hunting seasons alone can be enough to keep small businesses operational for another year. The even better news is hunter numbers and spending are growing. Between 2006 and 2011, the USFWS reports that the number of hunters in our country increased by 9 percent. Spending on hunting-related products and services grew by more than 30 percent in that same time frame.

“Hunters are passionate about their sport and are willing to spend more than the average consumer in order to participate in this rich tradition,” says Steve Sanetti, president and CEO of the National Shooting Sports Foundation (NSSF). “With their numbers growing, spending is growing accordingly, which is going a long way to help support jobs and small businesses across America.”

With the support of the hunting and shooting sports industries, the Federal Aid in Wildlife Restoration Act was passed in 1937 and placed a special excise tax on firearms and ammunition to be shared among state wildlife agencies for the exclusive purpose of supporting conservation efforts. Since the program began, hunters have contributed over \$7.2 billion to state conservation efforts. Given current levels of firearm and ammunition sales, hunters now contribute over \$371 million annually.

But the funding doesn't end here. Add in the \$796 million spent on license and permit sales, which go directly to the hunter's respective state wildlife agency, and the \$440 million in annual donations directly to conservation and sportsmen's organizations, hunters contribute over \$1.6 billion annually to conservation. Hunting is without peer when it comes to funding the perpetuation and conservation of wildlife and natural habitats.

“Over the last 75 years, hunters and recreational shooters have shown their willingness to pay a little extra for their excise-taxable gear, knowing that their purchases would directly

support conservation along with a multitude of wildlife-related activities,” said Jeff Vonk, secretary of the South Dakota Department of Fish, Game and Parks and president of the Association of Fish and Wildlife Agencies. “The financial contributions of sportsmen and women help state fish and wildlife agencies restore and manage wildlife and their habitats; open and maintain access for all, including shooting ranges; and they keep the public safe by supporting hunter education.”

A few national statistics from 2011 illustrate the vast impact that hunting has on the national economy:

- 13.7 million licensed hunters
- \$38.3 billion generated in total expenditures
- \$86.9 billion generated in overall economic output
- \$26.4 billion salaries and wages
- 680,937 jobs created
- \$5.4 billion in state and local taxes
- \$6.4 billion in federal taxes

Nationally, hunting overall brought in more revenue (\$38.3 billion) than Google (\$37.9 billion) or Goldman Sachs Group (\$36.8 billion). Sportsmen contribute nearly \$8 million a day that goes to support wildlife agencies and conservation.

The Impact of Hunting on the South Carolina Economy

The economic impact that hunting in South Carolina is seen in the U.S. Fish and Wildlife Service's 2011 National Survey of Fishing, Hunting and Wildlife-associated report. This report states that in 2011, a total of 253,540 resident hunters in South Carolina (Table 1) spent nearly 700 million dollars (Table 2). This amount of money has a significant economic impact on the state of South Carolina as well as an impact on many lives.

The 253,540 resident sportsmen in South Carolina (Table 1) were responsible for adding \$300 million in salaries and wages (Table 2). They also added \$76 million in federal taxes as well as \$50 million in state and local taxes (Table 2). The money spent by these sportsmen in South Carolina also adds a ripple effect in the South Carolina economy of nearly a billion dollars (Table 2).

Conclusion

In South Carolina hunting is good for the state's economy. Hunting generates nearly a billion dollars annually, with almost \$700 million

generated in retail sales. The state and local tax bases are also boosted by nearly \$ 50 million dollars. Statewide, hunting has created more than 20,000 jobs and generates annual salary and wage payments in excess of \$300 million dollars.

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Tables

Table 1. Number of Hunters

Location	All Hunting	Deer	Migratory Bird
South Carolina Resident	253,540	196,210	62,989
South Carolina Non-Resident	40,704	-	-
United States	13,674,385	10,851,220	2,575,692

Table 2. Economic Impact of Hunting in South Carolina (2011)

Location	Retail	Multiplier	Salaries/ Wages	Job	State/Local Tax	Federal Tax
SC- All	\$658,420,987	\$988,688,714	\$301,861,172	20,011	\$49,939,385	\$73,630,962
SC – Deer	\$348,021,347	\$533,088,951	\$181,975,487	14,324	\$31,279,524	\$44,527,746
SC - NR	\$54,099,366	\$92,009,029	\$19,387,606	897	\$6,422,573	\$3,327,265

The Development of a Performing Artist Via The Art of Concert Production

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Abstract—*In order to become a successful musician in today's highly competitive artist marketplace, the independent contemporary commercial musician must set oneself apart from other artists by being skilled not only as a performer, but also as a director, publicist, and stage manager. The focus of this research entailed producing two University of South Carolina Upstate Commercial Music Honors concerts at the Chapman Cultural Center's David W. Reid Theatre in Spartanburg, SC. Dr. Tricia Oney serves as the Director and Coordinator for USC Upstate student concerts at the Chapman Cultural Center. For the October 2013 installment of this bi-annual concert series, Blake Lewis served as Dr. Oney's assistant director, talent scout, publicity coordinator, stage manager, and one of the performers. Because of the specific and demanding responsibilities each role required, Blake learned and developed skills having paramount importance to the contemporary commercial musician.*

Keywords — Concert production; stage management; concert planning; contemporary commercial music; music industry

Introduction

Contemporary commercial musicians equipped with skills in organization, public relations, communication and leadership set themselves apart from their competition by offering a more marketable independent artist-entrepreneur to arts organizations interested in hiring talent. These skills readily avail themselves to motivated artists willing to watch and learn from successful independent artist mentors in the music business. In 2012 the Chapman Cultural Center in Spartanburg, SC named Dr. Tricia Oney to be the Director-Liaison-Coordinator of USC Upstate student concerts at its professional regional performance venue, the David W. Reid Theatre, a 400-seat concert hall. In order to give her research assistant practical experience producing a public concert from beginning to end at a top-flight performance venue, Dr. Oney appointed Blake Lewis to serve as her Assistant Director for the production. This appointment resulted in Blake assuming several different roles throughout the production timeline for the concert, starting several months in advance of the production date. Each

role built particular skills relevant to the career of a successful commercial musician.

Planning and Casting

In planning this concert, the authors' ultimate goal was to provide an excellent concert experience on a professional regional stage that highlighted strengths of the USC Upstate Commercial Music program. This was to be accomplished by showcasing a variety of performances by outstanding student soloists and ensembles. To achieve this, performers were required to prepare an audition showing excellent performance preparation a minimum of three weeks before the concert. Blake established and advertised the audition date in order to allow students enough time to adequately prepare and rehearse in advance of the performance. Parameters including audition requirements, acceptable genres of music, and time constraints were set and communicated to all music majors. Posted signs throughout the Humanities and Performing Arts Center and targeted emails informed students about the audition process, guidelines, location and date. Auditions were held during a two-hour time slot in the recital hall within the performing arts center. Once the auditions were completed, Tricia Oney and Blake Lewis determined which musicians would perform in the concert based on audition preparation, appropriateness of repertoire, performance skill, and how well each selection fit within the entire concert scheme. Some contestants were asked to make significant changes to their performances in order to meet the aforementioned criteria. For those students, a second audition was required to ensure their final product was acceptable and appropriate for the concert. Blake communicated early in the semester with faculty ensemble directors, inviting each to prepare one to three pieces for their ensemble to perform. After ascertaining interest levels among faculty directors, Blake discussed class times with each director during which he visited the ensemble rehearsals to track their progress. Ultimately there were a few songs that had to be eliminated from the program because they were not progressing as well

as the ensemble director and talent scout would have liked. As talent scout, Blake Lewis developed skills of critical listening, audition adjudication, communication, and organization. When the concert repertoire and performers were finally selected, Blake began to shift his focus from casting to other roles.

Publicity

Marketing the show well was necessary to ensure robust attendance, regional program visibility, and community engagement. Blake followed several steps to properly advertise the show to the public. First, Tricia Oney made contact with Jack Roper of the *Morning Show with Jack and Kimberly*, requesting that Blake appear on their regional television news show to discuss the Chapman Cultural Center concert as well as perform a song from the program. Second, Blake began coordinating with USC Upstate's University Communications department. He worked closely with a designer from that office to design posters and marquee advertisements. The posters, once designed and proofread by Blake, were displayed across the entire Upstate campus as well as in strategic locations in the downtown Spartanburg area. The marquee advertisements were displayed on television screens located in various lobbies and offices on campus. Tricia Oney wrote a press release containing all pertinent information about the upcoming show. Blake then forwarded that release to various media outlets in the region, asking each to publish or broadcast the information accordingly. Communicating with the USC Upstate poster designer was a frequent, ongoing back-and-forth process involving several subtle changes to the text. Proofreading each edited version of the poster became more and more tedious with each successive proof. The third step taken to advertise the show included making contact with Bill Drake of the *Awake with Drake* morning radio program. Mr. Drake is a veteran speech and communications instructor at Upstate and hosts his own regional radio program. He was happy to help and invited Blake to be a guest on his program several days before the concert. While the interview was brief, only lasting several minutes, it offered Blake another opportunity to publicize the show, experience a live radio interview, and create greater community awareness about the USC Upstate Commercial Music program. As publicity coordinator for this concert, Blake Lewis developed an artist's necessary skills including communication, organization, press release creation and editing.

Stage Management

During the publicity stage of planning the concert, Blake also needed to consider stage management. First he made contact with the Technical Director of the David W. Reid Theatre to discuss the performers' technical needs. Necessary equipment included guitar and bass amplifiers, guitars, drumset, several microphones, music stands, a full PA system, floor monitors, chairs, a grand piano and choir risers. Blake then listed inventory that would need to be transported from USC Upstate in addition to the equipment that would be provided by the Chapman Cultural Center. Blake then arranged to borrow a truck to personally transport Upstate's choir risers and amplifiers to the venue on the day of the performance. He and Tricia Oney also contacted student performers to help transport various items. As stage manager Blake planned the logistics of moving equipment on and off the stage during the concert and recruited fellow performers to help. Oney and Lewis programmed the musical pieces in such a way to ensure that minimal time would be required for moving equipment. On the day of the concert Blake assisted the venue's Technical Director in achieving optimal sound and lighting in the hall. He helped direct the sound checks for several ensembles and soloists, tested microphones and monitor placement, and listened to sound balance levels so that adjustments could be made to enhance the sound in the auditorium. As assistant director, Blake also assisted Tricia Oney in coordinating all performers for their ensemble sound checks, warm-ups, equipment moving responsibilities and stage entrances and exits. Overall, Blake oversaw and directed forty-seven student performers. Acting as emcee, Blake also personally greeted the audience from the stage at the beginning of the concert, introducing the program and thanking the audience for their attendance and support. As stage manager Blake developed and utilized skills of organization, time management, delegation of responsibility, leadership, and public speaking.

Performing

In addition to the monumental responsibilities Blake experienced in planning, developing, publicizing, and stage managing the concert, he also needed to develop mental toughness in order to focus on his performances amid his myriad other responsibilities on the day of the show. Performing was the responsibility with which he felt the most comfortable, the most able to excel, and the most prepared to succeed. He performed

as a soloist with the Music Theatre Voice Class and was featured in two ensembles (the Upstate Vocal Ensemble and the Commercial Music Combo). As a performer, preparation for the show began months before the show happened. His songs were polished and fine-tuned during class times, applied voice lessons, and hours spent rehearsing on his own. His participation in the performances by the Upstate Vocal Ensemble and the Commercial Music Combo required team work and hours of practice and rehearsing. As a section leader in the Upstate Vocal Ensemble Blake directed sectional rehearsals for tenors and basses in the choir, taught vocal parts to singers who were struggling, led warm-up exercises, and sometimes simply encouraged others to spend more time preparing music on their own. While balancing his other concert responsibilities with his performer role, Blake experienced growth in performance preparation, mental toughness, concentration, and ensemble direction.

Conclusions

In today's highly competitive artist marketplace, artists are required to be savvy communicators, excellent time managers and responsible businesspeople. The art of concert production involves the implementation of key skills that enable artists to successfully fulfill important roles including talent scout, director, stage manager and public relations coordinator. Learning to fulfill these roles helps artists add value to their contributions to the arts marketplace and to their communities. Developing and applying such skills will enhance an artist's ability to work well with others, to plan and produce successful concerts, and to enjoy a successful career in music.

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The Critical Impact of Revenue and Cash Flow on a Successful Medical Practice

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Abstract – *In recent years healthcare providers have been forced to make adjustments to cope with rising deductibles and gaps in the insurance coverage of their patients. This study was conducted at a large medical practice that handles in-house medical billing and coding for their patients. The purpose of the study was to evaluate the billing and collection methods of the practice to determine the effect the current policies and procedures have on cash flow. In recommending changes to the process input from those involved in the process should be considered. A survey was used to collect the data from the staff involved in the billing and collection processes. The results indicated that the majority of the staff agreed that delayed insurance payments due to error and that lack of follow-up will delay payments. However, results varied between office staff and billing department staff in regard to the office staff's failure to collect the proper payment at the time of service. The study provided information on how front office collection processes, improper billing, and timely patient follow-up are perceived by employees. The data collected will be helpful in recommending changes to the process and improving cash flow in the practice.*

Keywords – Revenue Cycle, Cash Flow, Healthcare, Medical Practice

Introduction/Problem Background

The healthcare industry represents the most significant component of the US economy's gross domestic product. The industry is multifaceted and extremely complex, requiring medical practices to continuously strive to keep up-to-date with the developments that profoundly impact them (Larson Allen LLP, 2008).

In 2003 federal legislation was passed that provided tax incentives to employers offering plans with high deductibles. As a result consumer driven healthcare began to rise in popularity. The purpose of consumer driven healthcare is to provide a solution to the growing costs of healthcare. The trend toward customer driven healthcare has caused a dramatic economic shift for medical practices. Healthcare providers have experienced the impact of this trend in their revenue cycles (LarsonAllen LLP, 2008).

Medicare is the largest and most significant of all healthcare insurance providers in the US. Medicare benefits have experienced continuous

cuts over the last thirty years. Funding for Medicare continues to deplete with each passing year. Medicare patients represent a significant percent of the patients in many medical practices. With the aging of the baby boomers, the population of Medicare patients is expected to increase dramatically (Houke, Ivory, & Amaria, 2010). Aldhizer (2009) predicts that in the absence of changes with major impact to the Medicare and Medicaid funds they will continue to stretch to the breaking point.

In 2010 the Obama Administration brought new and radical changes in the financing and delivery of healthcare with the enactment of H.R. 3962 (Affordable Health Care for America Act) (OpenCongress.org, 2010). Many parties have been or will be affected in the future by this legislation. Francis (2013) advises physicians and medical practices to take stock of where healthcare law is headed and evaluate the impact.

Healthcare providers have been forced to make adjustments to cope with rising deductibles, increases in co-pays, co-insurance expenses, and gaps in coverage (LarsonAllen LLP, 2008). Healthcare providers must adopt new strategies to deal with rising costs and shrinking reimbursements to remain solvent in the new environment.

The large medical practice in this study is located in a large metropolitan area in South Carolina. They have chosen to handle medical billing and coding for their patients in-house for over thirty years. They are stretched over six physical locations with more than one-hundred staff members dealing with multi-insurance providers. Billing and collections can be complicated and overwhelming for them.

Recently patient counts and accounts receivables have increased. However, the cash flow does not appear to follow those variables. This study looks at the likely causes to determine if any procedural or implementation changes or corrections need to be made. In recommending changes to processes the input from those involved in the process should be considered. This should help to increase buy-in and improve the results the recommended changes have on all parties.

Purpose of Study/Research Questions

The purpose of this study was to evaluate the billing and collection methods of the medical practice in order to determine the effect the policies and procedures in place have on cash flow.

The research questions addressed in this study were as follows:

1. Does improper billing cause a delay in timely payments and reduce cash flow?
2. Does lack of timely patient billing and follow-up cause delays in payments?
3. Does the front office staff collect proper amounts due at time of service?

Literature Review

Medical Practices today face many challenges in managing their revenue cycles. Effective revenue cycle management is critical in managing cash flow and remaining solvent. An increasing number of patients are subscribing to consumer driven healthcare plans that have higher deductibles, Kareo (2012) reported that nearly 30% of the revenue in medical practices is expected to be paid out of the pocket of the patients.

The Physician Revenue Gold Standard Study (LarsonAllen, LLP, 2008) focused on key factors that helped to produce the best performing business office/revenue cycles. They used Gateway EDI's (a claims processor) database that included data from over 40,000 physicians in all 50 states in order to identify the best practices. Findings were reported from the top 23 physician practices that consistently outperformed their peers in accurate electronic insurance claims submission. Written procedures were found to provide guidelines and the framework needed for staff to carry out their responsibilities. The best practices posted charges and transmitted claims within 24 hours of the time of service and dealt with denials within a 48 hour window.

Weymier (2003) found that many practices do not aggressively collect co-insurance because of the uncertainty of the final amount. He recommends the practice have a policy in place to estimate co-insurance and deductibles and communicate this information to their patients. Merisalo (2004) suggests that health care providers be diligent and implement strategies to work with patients to ensure self-pay dollars do not end up as bad debt. *The Physician Revenue Gold Standard Study* (LarsonAllen, LLP, 2008) reported that 74% of the top US practices discuss expected self-pay amounts with patients during their first visit.

Duchek (2012) reports the average cost of staff time to rework a denied claim is \$40 and that cost can add up quickly if multiple claims are rejected. Care should be taken to bill correctly the first time. *The Physician Revenue Gold Standard Study* (LarsonAllen, LLP, 2008) reported that in the best practices 91% required that the coding be reviewed by the billing/coding staff before the claims were filed. This extra step helped contribute to the quality and accuracy the claims filed.

May (2004) recommends studying your current processes and conducting a root cause analysis. In an effort to improve front end processes in revenue cycle operations Our Lady of Lourdes Memorial Hospital conducted a root cause analysis. They identified in patient registration accuracy as being correct only 30% of the time at the hospital. This analysis revealed opportunities to improve the process. Changes were made to processes reducing their days in accounts receivable from 100 days to 42 days and a 13% reduction in self-pay receivables was experienced within three months (May 2004).

Methodology

The population for the research study included the front office staff and individuals employed in the billing and collections department of a large medical practice in South Carolina. Feedback was sought from these two groups to obtain their perceptions about the effect of various factors on cash flow.

A survey was used to collect data for the study. The purpose of the survey was to determine what effect the current billing and collection procedures have on cash flow. This information may be used to implement changes to the collections and billing process and improve cash flow in this medical practice. An added benefit of the survey is to obtain buy in from the employees in implementing future changes.

Data Analysis and Results

The survey was distributed to forty-seven employees. Eleven served the company as billing and collection staff while the remaining thirty-six were in the front office at one of six locations. All personnel surveyed were employed by the medical practice. All forty-seven surveys were returned resulting in a response rate of 100%.

The results of the employee survey indicated that 85% the staff "agree" to "strongly agree" that delayed payments from an insurance company due to an error restrict the company's cash flow. Unfortunately historical records were not

maintained that would confirm that improper billing procedures delay payment. The survey also revealed that 86% percent of the staff “agree” to “strongly agree” that lack of follow-up with patients will delay payments.

The answer to one of the questions on the survey varied greatly between office staff and billing department staff. Of the office staff surveyed 63.8% “strongly disagree” to “moderately disagree” that the office staff fails to collect the proper patient payment at the time of service. Of the billing department staff surveyed 0% “strongly disagree” and only 6.8% “moderately disagree” that the office staff fails to collect the proper payment at the time of service. A significant finding in this study was the lack of understanding about the functions of the two related departments. While the front office staff appeared to believe that they are collecting the proper payment at the time of service, the billing and collections department that handles the collections of patient fees does not agree that the office staff is collecting the proper payment at the time of service.

Conclusions and Recommendations

This study provided information on how front office collection processes operate at the time of service and how improper billing, and timely patient follow-up are perceived by front office and billing and collections employees. The data collected should help in implementing changes to the process and improving cash flow in the practice.

The front office needs to be more knowledgeable of the full implications of failing to collect payment at the time of service. In addition, the study suggests that a proactive patient follow-up system will help to reduce the collection cycle and improve cash flow for this medical practice.

Further research into implementing a system, to track individual billing and collection staff accuracy of claim filing is recommended as well as tracking actual write-offs. This study brought to light that as accounts receivable age they can be written off by individual employees. This could represent a way for an employee to conceal incorrect claims that are not tracked and corrected. The combination of these two lapses in accountability increases the likelihood of a decrease in claims collected that ultimately decreases cash flow.

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The IT Access Security Process: Speed of Execution and Customer Satisfaction

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Abstract – Corporations continue to explore lean ideas and tactics as they prepare to capitalize on recovery and survival of the downturn following a decline in the economic environment. The purpose of this study was to evaluate customer satisfaction associated with the proposed elimination of Business Unit Manager's approval prior to processing Enterprise Resource Planning (ERP) user requests. These requests are part of the Information Technology Access Security Process that serves ERP users in three key divisions in this company. Personal interviews and surveys were used to collect information. The results indicated that improvements were needed and that the Business Unit Manager's approval should be eliminated as a requirement prior to processing ERP user access requests. Data collected after the implementation of these findings showed that the new process reduced delays.

Keywords – Lean, Process Improvement, Customer Satisfaction, Information Technology

Introduction/Problem Background

Corporations continue to explore lean ideas and tactics as they prepare to capitalize on recovery and survival of the downturn following a decline in the economic environment. The multi-industry company in this study is faced with these same challenges. At an annual meeting attended by executive leaders from across the businesses and corporate office, the message from the Chief Executive Officer (CEO) was clear. He emphasized the importance of focusing on simplicity, speed, functional excellence, and reducing bureaucracy. He indicated that decision making should be accelerated while preserving compliance.

This multi-industry company is a pioneer of the diversified business model. Founded almost 100 years ago, it has grown into a network of businesses with total revenues of over \$10 billion, employing over 30,000 people with facilities and presence in more than twenty countries serving a diverse and global customer base. It is ranked in the Fortune 500 list of largest U.S. companies. Organizationally, they have numerous subsidiaries and operating divisions that are responsible for the day-to-day operation of their businesses. This study focuses on process improvements to three key divisions.

In light of the CEO's directive, processes should be identified that need to be improved. A Continuous Improvement Initiative was designed to eliminate waste and drive growth throughout the company. The Control Standard to process requests for Information Technology (IT) Access Security in ERP requires validation and documentation of required approvals prior to processing user access requests. The current process of obtaining prior approval for ERP user access is often lengthy due to delays in obtaining approval of the Business Unit Manager. Further examination reveals these delays result from (1) failure on the part of the Business Unit Manager to approve requests in a timely manner, or (2) incorrect entry of the Business Unit Manager's email address at the time the request was created.

If the first layer of approval on the ERP User Access Request Form is eliminated, the time Business Unit Managers spend in reviewing and approving ERP User Access Requests should be significantly reduced. Business Unit Managers could be informed of access requests as they are being processed, resulting in a much shorter wait time for users to receive ERP access.

A key factor to driving successful process improvement is the assessment of customer satisfaction. As processes are reviewed and as changes are identified and implemented to simplify processes, reduce bureaucracy, and accelerate decision making, customer satisfaction should increase. In recommending changes, the input of those involved with the process should be considered. This should help to increase buy-in and improve the effect the recommended change will have on all parties.

Purpose of Study/Research Questions

The purpose of the study was to evaluate customer satisfaction associated with the proposed elimination of Business Unit Manager approval prior to processing ERP user requests. Prior approval is part of the Information Technology Access Security Process that serves three key divisions in the company.

The research questions addressed in this study were as follows:

1. Will Business Unit Managers and the Executive Leadership Team agree to the proposed configuration changes to the ERP User Access Request Form to allow the elimination of Business Unit Manager approval prior to processing requests?
2. To what extent will ERP users experience delays in receiving access if the Business Unit Manager approval prior to processing requests is eliminated?

Literature Review

Industries today face many well-recognized challenges. Among these challenges are the high cost of operations, inefficiency, and insufficient access to information (Helms, Moore, & Ahmadi, 2008) resulting in the need for continuous improvement. The literature demonstrates that in order to succeed in today's competitive environment, understanding and addressing customers' needs and wants is critical. Researchers, therefore, have addressed related issues and services from a customer perspective.

One such study attempted to complete the first two steps of the eight-step procedure as described by Churchill in developing construct measures (Churchill, 1979). These two steps were (1) specifying the domain of the construct and (2) generating a sample of items. To accomplish this, the researchers interviewed a group of 18 Information Technology professionals working in central technology offices in the southeastern United States. The informants were chosen due to their extensive experience in support pertaining to IT operations for their firms. The interviews were semi-structured following an interview guide with 16 questions. Each interview lasted between 15 and 35 minutes. Most of the interviewees indicated that one of the areas organizations continue to struggle with is determining what makes a good customer experience (Gehling, Turner, & Rutherford, 2007).

The review of the literature indicates the need for continuous improvement in addition to customer satisfaction and supports the proposed research project. The company needs to take steps to evaluate the customer satisfaction of the internal parties associated with the proposed elimination of Business Unit Manager approval prior to processing IT Access Security requests. The current process is required of ERP users at three key divisions within the company. Due to the success of past surveys, as indicated by the review of the literature, it was recommended that the

survey method be utilized for the purposes of this research.

Methodology

Customer satisfaction was sought from those associated with the potential elimination of Business Unit Manager approval prior to processing ERP user requests. ERP user requests are part of the IT Access Security Process that serves three key divisions in the company.

The population for the project sample consisted of individuals who use the IT Access Security Process. The sample was broken down further into two distinct groups. Group I included members of the company's Executive Leadership Team (Senior Leadership, Audit Services, and Controls). Group II consisted of Business Unit Managers and ERP Data Owners from the three key divisions in the study.

The basic tools used to collect the data for this project were (1) personal interviews, (2) surveys, (3) annual ERP Data Owner Reviews, and (4) an Administrative Panel Database. Surveys were used to gather information regarding the elimination of Business Unit Manager approval prior to processing ERP User Access Requests.

Data Analysis and Results

Eleven of the Group I members of the Executive Leadership Team were personally interviewed. Of the eleven interviewed, 100% of the interviewees were in agreement that configuration changes should be made to the ERP User Access Request Form to eliminate the Business Unit Manager approval prior to processing user requests.

Of the forty-eight members of Group II surveyed, thirty-three responded. Ninety-one percent of the respondents indicated a need for improvement. Of the fifty-four Business Unit Managers and ERP Data Owners who participated in the Annual ERP Data Owner Reviews for 2010, 63% listed recommendations for user access changes. However, the remaining 37% did not recommend any changes.

The results of Group I indicated that the majority of the survey population was in agreement. The approval of the Business Unit Manager should be eliminated as a requirement to process ERP user access requests. The results of Group II interviewees revealed the majority were in agreement that improvements were needed to the existing IT Access Security Process.

Based upon the project results, configuration changes were applied in October 2010 to the ERP

User Access Request Forms for the three divisions to allow for the elimination of Business Unit Manager approval prior to the processing of requests. To determine if a change in delays in granting user access had occurred, ERP user access request forms were extracted from the Administrative Panel Database to measure the wait time before and after the configuration changes.

The results of the analysis indicated that following the configuration changes 100% of the ERP access requests submitted did not experience delays in receiving access due to elimination of the Business Unit Manager approval before processing was allowed to begin. While 100% of the requests for ERP access submitted prior to the configuration changes experienced a delay.

Conclusions

Management should continue to assess ways in which to improve the IT Access Security Process that serves these three divisions, targeted at streamlining the process and improving overall customer satisfaction. Other processes at the company should be examined for potential restructure or elimination. There is still ample opportunity to innovate and further streamline existing processes.

While the success the company experienced from implementation of this change may seem small, collectively many incremental efforts to improve processes will have a significant impact on improving efficiencies and customer satisfaction over time. While some lean projects (e.g., major plant rearrangements) are capital intensive and may have to wait, hundreds of other small improvements can be supported with nominal expenditures. This level of lean implementation should not be interrupted. Lean principles apply to both the shop and the office.

All organizations need to continuously explore lean ideas and tactics as they prepare to capitalize on recovery and survival in a volatile economic environment. The multi-industry company in this study is no exception. The company faces many challenges including market competition, high operations costs, inefficiency, and insufficient access to information.

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Evil Mothers and Rebellious Daughters: Popular Self-Injury Films

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Abstract – “Self-injury” (SI) is a term used to describe a condition wherein individuals deliberately harm their bodies without suicidal intent. As with many health concerns, particularly those shrouded in secrecy and marked by social stigma, both the general public and those with the condition often turn to media for information about the causes, symptoms, cures, and preventive measures. This study uses Kenneth Burke’s dramatic pentad and his guilt-redemption cycle to reveal patterns and assumptions within and across four popular films that prominently feature SI: *Prozac Nation*, *Thirteen*, *Painful Secrets*, and *Girl, Interrupted*. Each film draws from the well-known, albeit largely discredited, Oedipal complex, so that girls are shown to seek closer attention to distant fathers, while at the same time rejecting manipulative and malicious mothers.

Keywords – self-injury, self-harm, dramatism, guilt, redemption

Introduction

“Self-injury” (SI) is a term used to describe a condition wherein individuals deliberately and repeatedly harm their bodies without suicidal intent. The condition has been widely reported in many parts of the world and seems to be most prominent among adolescents.

As with many health concerns, particularly those shrouded in secrecy, both the general public and those with the condition often turn to media for information about the causes, symptoms, cures, and preventive measures. Several studies have been conducted on portrayals of SI in films. Whitlock, Purington, and Gershkovich (2009), for example, examined 36 films, finding that most self-injurers portrayed were female, white, members of the middle or higher socio-economic classes, in their teens, twenties, or thirties, and suffered some form of mental illnesses beyond self-injury—suggesting

that films inaccurately frame SI as a condition affecting white, wealthy females. Similar results were reported by Trewavas, Hasking, and McCallister (2010).

This study addresses three questions not yet examined in the scholarship:

1. What films featuring SI are given the most attention by the lay public?
2. How are SI and self-injurers rhetorically constructed within the films?
3. Is there a consistency across the films with regard to that construction?

Methodology

I conducted a series of Google searches looking for films pertaining to self-injury, examining 32 sites that appeared with regard to such terms as “self-harm movies” and “self-injury films.” From all the films mentioned, I limited my sample to the top four films so that I would have enough space in this paper to conduct a meaningful thematic analysis across the sample. The process was iterative in that I watched the films, made notes, and looked through scholarship on film, narrative, psychology, health, and other fields to find a means of explaining the patterns that I saw and heard in the films.

The four films in the sample are *Girl, Interrupted* (1999), *Painful Secrets* (a.k.a. *Secret Cutting*) (2000), *Prozac Nation* (2001), and *Thirteen* (2003). In all films, the self-injurers are adolescent females ranging from thirteen to about eighteen. Each of the protagonists are white and financially well off, with the exception of Dawn, in *Thirteen*, who comes from a lower middle-class family.

Fig. 1: List of characters.

Title	Protagonist	Mother	Father	Friend	Therapist
<i>Girl, Interrupted</i>	Susanna	unknown	unknown	Lisa	Dr. Sonia Wick
<i>Painful Secrets</i>	Dawn	Joyce	Russell	Lorraine	Dr. Parella
<i>Prozac Nation</i>	Lizzie	Mrs. Wurtzell	Donald	Ruby	Dr. Sterling
<i>Thirteen</i>	Tracy	Mel	Travis	Evie	none

Analyzing the Narrative Pieces

Kenneth Burke's dramatisic pentad provides a useful starting point for analyzing narratives. Commonalities among all four of the sample films' pentadic structures are easy to see. In each film, for example, mothers (agents) attempt to control their daughters (acts) through combinations of force, acts of kindness, and emotional manipulation (agency) particularly within the domestic sphere (scene) which is threatened by daughters' deviant behaviors, including SI (purpose). For instance, Dawn's mother, Joyce, in *Painful Secrets*, busies herself with cooking and other household chores throughout the film while trying to hold her family together in response to Dawn's SI. She continually monitors Dawn, ritually examining Dawn's body before bed each night. Joyce even finds a way to monitor Dawn's behavior when Dawn leaves the family home by presenting her daughter with a cell phone—a relatively new invention at the time. Through the connection of the mobile phone, Joyce attempts to fence Dawn within her domestic sphere. Later, while lying in her bed, Dawn uses the same phone to arrange to meet a boy who uses her for sex.

Dawn's use of her mother's cell phone exemplifies how daughters in the films (agents), in turn, enact various forms of deviance (acts)—sexual experimentation, drug use, and so forth—with the help of their friends outside the home (scene) in order to assert their independence (purpose). Scenes of performing breaches of order are thus outside the mother's realm but also on the young women's bodies, signifying self-agency over their bodies, albeit self-destructive agency.

The Guilt-Redemption Cycle

While the pentad reveals narrative elements in relation to one another, Burke's guilt redemption cycle adds a temporal dimension illustrating how tension and release among elements play out in a patterned progression of steps. The cycle begins with a hierarchical ordering of values, people, beliefs, and power in which characters live in stable circumstances. The negative phase occurs when an actor recognizes the constructed nature of reality and rebels against both the structure and their place within it by sinning against the established order. A sense of guilt arises within the individual which must be must be purged either by self-blame (mortification) or by blaming others (victimage). Redemption is the final stage wherein punishment is meted out and the individual is permitted to rejoin hierarchical society.

In each of the four stories, hierarchical order is established in ways that are remarkably consistent with Sigmund Freud's Oedipal complex. Although much of Freud's conclusions about the psychosocial development of children has fallen out of fashion among critical cultural scholars of media, patterns described by Freud with regard to the Oedipal complex still resonate within the scholarship, pointing toward themes that routinely surface in films and other forms of narrative.

As we have seen, mothers attempt to control their daughters, holding them in a kind of infantile paralysis. In *Thirteen*, Mel refers to Tracy as "Baby." When torn between modeling herself on her friend's sexual promiscuity and her own identity as Mel's baby, Tracy twice resorts to cutting herself with a razor blade taken from the family's medicine cabinet. The blade is hidden behind a jar of petroleum jelly with the word "Baby" clearly marked on the label emphasizing Tracy's dilemma.

As noted above, mothers' power resides within the domestic sphere. Although Susanna's mother who is only seen at the beginning of the film, she too is a domestic power, and having failed to control her daughter at the familial home, she packs Susanna's bag so that Susanna can live in an institutional home where she is infantilized even more through behavioral rules and a perpetually mildly drugged state of compliance.

Having discovered Dawn's habit of self-injuring, Joyce tightens her grip on her daughter by increasingly treating Dawn like a baby. Midway into the story, Joyce humiliates Dawn at the dinner table—the centerpiece of Joyce's domestic domain—by insisting on cutting Dawn's meat for her. Similarly, Joyce also inspects Dawn's nearly naked body every night prior before putting Dawn to bed, robbing Dawn of intimate privacy and ownership of her body as it matures into that of young woman.

Unlike mothers in the films, fathers work outside the home and, in Lizzie's and Tracy's cases, fathers have vanished *into* the world. As a form of hierarchical breach, each of the young women attempt to break away from maternal control by venturing into the world known by their fathers.

Examined within the Oedipal framework of hierarchical family tensions across all four films, the act of SI is a significant narrative element. Protagonists self injure or almost self injure when faced with attacks upon their developing sense of themselves as autonomous agents within the drama of their own lives. SI is a form of temporary release, an escape into their private selves amidst public spaces.

While SI is portrayed as an inward escape, it is also linked with a growing and confused sense of sexuality. After a drunken row with her mother, in the presence of her grandmother, Lizzie lies on her bed with a bottle of wine suggestive of a phallus. She casually twirls a razor blade between her fingers, apparently considering self injury. Rather than cut herself, however, she picks up the phone and calls a young man with whom she has begun a sexual relationship.

With regard to sexuality and the portrayal of SI in the films, Freud would have much to say. In *Painful Secrets*, SI as a nexus between developing sexuality and desire for intimacy with the father as demonstrated by Russell's hobby of glass cutting, wherein he uses a glass knife closely resembling the knife that Dawn uses upon herself. The film clearly voices the inappropriate nature of incestuous tendencies, however, when Russell confronts Dawn in the second half of the film. Ever more frustrated and unable to cope, Dawn eventually offers her body to her boyfriend and his two male friends all at once. Waking up later, she cuts herself so badly that she is hospitalized.

Inappropriate sexual desire for the father represented by SI is driven home further in *Girl, Interrupted* when Susanna and a friend, Lisa, escape from the hospital into the world beyond institutional domesticity. They visit Daisy, a former patient, who lives in a tidy apartment paid for by her father. There, Lisa accuses Daisy of not only regularly having sex with her father, but also of enjoying it. Daisy does not deny it, but retreats to her bedroom. The next morning, Susanna finds that Daisy has hung herself and that there are dozens of cut marks on her body.

To sum up, hierarchical order within the home is dominated by mothers who desire to infantilize their daughters and to relive their own unfulfilled lives through their manipulations of their daughters. Hierarchical order outside the home is the realm of fathers and, while it is chaotic and dangerous, it is also the means through which daughters desire to shed their identities as babies/children and distance themselves from their mothers by violating social taboos and abusing their bodies. SI acts as a release from tensions between hierarchy and agency.

Now that we have seen how transgression leads to guilt, the question arises as to how guilt is purged via redemption. Burke provides two possibilities: mortification via confession and personal sacrifice by the transgressor or victimage through which blame is assigned to someone else.

In *Prozac Nation* and *Painful Secrets*, both Joyce and Mrs. Wurtzel confess to causing their

daughters self-injurious tendencies. Guilt is assigned in the opposite direction in *Thirteen* and *Girl, Interrupted*, with blame being assigned to the young women for their behaviors. Casting and acceptance of blame in Susanna's case takes a longer and more circuitous path in *Girl, Interrupted*, ultimately leading her to welcome retribution offered by her therapist.

Indeed, each film except for *Thirteen* features a female therapist who serve to redeem—in Burke's model, to reintegrate—the sinners back into the social order. Although each therapist maintains some degree of professional distance, each is also linked with maternal signifiers suggesting that their role is, if not to be an alternative mother, then to redirect the young women toward their seemingly appropriate roles as mothers. Read in this light, none of the young women fare well in the end, despite what appear on the surface to be traditionally optimistic Hollywood endings, with the exception of *Thirteen*.

Conclusion

Each of the films represents SI through tried and true Oedipal narrative conventions, framing complex concepts for public consumption. Framing is filtered through and re-presents cultural values, norms, and expectations about appropriate roles of young women and mothers, casting blame upon mothers and daughters who are marked as deviant. While such framing might function as a Hollywood convention, it counter-productive and simplistic frame through which to portray and consume the complex social and health factors associated with SI.

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Graffiti Culture as an Emerging Art Movement

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Abstract – *The project presents the audience with a wider perspective on the growing culture of graffiti and whether or not it can be considered “art.” The research examines different types of art including street art, also known as graffiti or vandalism to paid art. This project also considers different cultural and aesthetical questions. The projects focus is on how art is being expressed and whether controversial mediums are acceptable as an art form.*

Keywords-Graffiti, Art, Culture, Anthropology

Introduction

There have been many arguments among people questioning what establishes something to be an art. Every time Graffiti is brought up in an argument, people find themselves pondering if graffiti is actually an art. Most often societies frown upon graffiti and would not call it an art but a problem. The people within a society, mainly big cities are having a huge issue with graffiti; it is growing rapidly but also is becoming more accepted by teenagers, artists, and people who live with the motive of change. Societies fail to distinguish the different types of graffiti that are present when they claim street art as a societal problem; graffiti comes in many different forms, some are thought out and aesthetically pleasing and some that are for a rebellious purpose with no aesthetical value. Most graffiti artists would even agree that some of the forms of graffiti might come off as a problem instead of an art. The types of graffiti that exist may help it in defense to whether or not it is or is not an art form.

Graffiti as a subculture

Graffiti grew into a subculture by the markings of one guy, Taki. Taki began putting his name with a number after it known as a tag, all over the walls in New York. Other people with in New York started to notice his name on different walls in different cities. The people found this encouraging and found it to be almost a statement to the public. The other people fell together in a community of taggers; this began the hip-hop culture. The community

of taggers went to great depths to bring adrenaline to their tags, a main idea to the people was not to have the prettiest or most clever tag but to have a tag placed in a hard to reach spot. The people who had their tags in the most dangerous spots would be recognized more for their accomplishment. The culture also brought together alliances between the taggers with gangs; people in gangs wanted to use graffiti as a form of ownership or memorial for a dead loved one. People in New York began to associate graffiti with rebellious teens of the hip-hop trend and gangs; they did not like this and had to make a stand. Graffiti became frowned upon and laws were enforced.

Evolution and Types of Graffiti

Graffiti started out as a movement by Taki 183, it mainly consisted of tags; tags are just simple signatures usually consisting of a name or word followed by a number that represents something. The tags are considered a start to the graffiti movement, eventually graffiti changed into something bigger. Today graffiti is something more than names blatantly written on walls, graffiti has evolved into many different forms and express more than superiority. The main types of graffiti that have evolved are tags, pieces, throw ups, and productions. Tags have evolved into something more personal; people use tags to manifest their talents and to be recognized. Taggers usually make their tags out of shapes and numbers that form something that only they can understand. Pieces have evolved from the graffiti movement; a piece is considered a graffiti artist best work. Pieces usually consist of a lot of color, bubble letters, and a lot of labor. Most often the artist makes the piece out of their tag or their alias, pieces are usually found on trains and abandoned buildings. A throw up is another form of graffiti that resulted from the growing graffiti movement; a throw up is a less labor-intensive piece that consists of only two colors, mainly black and white. Lastly, productions emerged from the movement. A production is a large piece or mural that consists of a main character or

theme. Productions are large so they are rarely done due to the legality but they would be a great source of advertisement.

Graffiti as Artistic Expression

Graffiti, street art, vandalism, or whatever you would like to distinguish it as, is a growing and fierce form of expression for artists. Graffiti gives artists a chance to get their names out into the world and have their art spread. Tags are not aesthetically pleasing but they usually have a strong meaning behind them and are placed on items that will manifest the world; a construction cone is a good example, if a cone is tagged then wherever that cone goes, that tag will be displayed. This is a great way to show an artists expression through graffiti because they are expressing their want to get their name out anyway that they can even if it may get them arrested or fined. Expression also comes from the passion behind their works, all artists have a mental drive behind their artistic abilities and usually in graffiti it involves some kind of political statement to express underlying social and political messages. Graffiti as an expression is made to open the eyes of the people and make them think outside of the box.

Conclusions

Graffiti is a main source of vandalism in many cities but it is also a main source of art. Graffiti comes in many different forms and has developed overtime within different cultures. There are many people who have been discovered because of their consistency in vandalism. Graffiti possesses many attributes that regular arts posses; it has different forms, creators, evolution, and meanings. Graffiti has become more than an act of crime, it has become an art. Graffiti will continue to evolve into something bigger and eventually become more accepted or tolerated.

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Effects of Competitive and Cooperative Violent Game Play on Aggressive Behavior

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Abstract — *The effects of violent video games on aggressive behavior is a hotly debated topic. Due to contrasting theoretical viewpoints and a seemingly endless number of confounds, a consensus regarding whether violent video games are truly harmful has not yet been reached. This study sought to elucidate which theoretical viewpoint, social learning or frustration, best explains the relationship between violent video games and aggressive behavior. This was done by investigating the mediating effect of competition in an experimental study involving playing Call of Duty. Participants were split into three experimental groups: competitive multiplayer, cooperative multiplayer, and single player. Because competitive environments are more conducive to frustration, it was hypothesized that the competitive group would exhibit the most aggressive behavior. In-game performance was also assessed in order to determine if losing the game was related to increased aggressive behavior, which is what was hypothesized. Results did not support our hypotheses: the single player group exhibited the most aggression and winning, rather than losing, was associated with aggressive behavior. These results offer fresh insight regarding the mediating effect of competition on video game related aggression and the importance of including winning/losing as a mediating variable in future research in this area of study.*

Keywords — aggression, video games, competition, frustration, Call of Duty

Introduction

In the wake of media coverage of mass shootings and the growing popularity of video games depicting graphic violence, extensive research has been conducted in recent years in order to identify a relationship between these phenomena (Anderson & Bushman, 2001). Playing violent video games does appear to increase aggression (Anderson, et. al., 2010), but there are contrasting viewpoints regarding how these data should be interpreted (Ferguson, 2013). On the one hand, this relationship could be attributed to social-learning (Bandura, 1977), which follows that players of violent games become more aggressive because they learn the violent behaviors and are rewarded for committing them in the game. On the other hand, these effects could be explained by frustration, which follows that players of violent

games become more aggressive due to losing the game they are playing or otherwise having the in-game goal blocked (Berkowitz, 1989). If this theory is true, then violent content in video games is irrelevant in its capacity to increase aggressive behavior. Thus, it is apparent that research in this field of study should be focused on clarifying which of these theories plays the dominant role in the relationship between violent video game play and aggressive behavior. However, the difficulty in assessing which theoretical view point best represents the relationship between violent game play and aggressive behavior is not a simple task.

The reasons regarding the lack of theoretical consensus on this topic are far-reaching (Ferguson, 2013). A plethora of confounding variables plague the video game-aggression literature which make data difficult to interpret. Some of the major variables include, but are not limited to, research methods (Ferguson & Rueda, 2009), game realism (Barlett & Rodeheffer, 2009; Krmar, Farrar, & Gloin, 2011), realism of in-game violence (Krmar & Farrar, 2009; Jeong, Biocca & Bohil, 2012), the presence of a story or plot in the game (Schneider, Lang, Shin, & Bradly, 2004), as well as the type and frequency of violent in-game content (Eastin & Griffiths, 2006). Prior research also supports the idea that aggressive behavior elicited by violent video games may be mediated by competition rather than violent content (Adachi & Willoughby, 2011). This is a particularly enlightening finding considering that it supports the frustration theory of aggressive behavior. Although Adachi and Willoughby successfully controlled their experimental study to weed out the aforementioned confounds, their results warrant further research that measures competition objectively instead of measuring competition based on participants' rating of how competitive they felt the game was. To this end, this study, *Effects of Competitive and Cooperative Violent Game Play on Aggressive Behavior*, attempted to replicate Adachi and Willoughby's findings using objective measures of competitive game play. Two methods of measuring competition were used: designation of a "competitive" experimental group and record of in-game performance including whether or not the

participant won the game they played. It was hypothesized that participants in the competitive group would exhibit the most aggressive behavior and that losing the game would further mediate aggressive behavior as a result of frustration.

Methods

Participants of this study ($n = 48$) were divided into three experimental groups: competitive (player versus player), cooperative (multiple players versus a computer), and single player (one player versus a computer). All experimental groups played one twenty minute game of *Call of Duty: Black Ops 2* on the same in-game map (*Nuketown 2025*). Generally, good practice of experimental studies that measure the effects of violent game play on aggressive behavior used a control group that played a non-violent game. However, the goal of this study was not to see if there was a correlation between violent game play and aggressive behavior. This relationship has already been well-established (Anderson, et. al., 2010). Rather, the goal of this was to further explore the mediating effect of competition in this relationship, which is best done by controlling as many other-game related variables as possible.

Two tools were used to measure aggression: the Hot Sauce Paradigm (Lieberman, et. al., 1999) and the Buss-Perry Aggression Questionnaire (Buss & Perry, 1992). The Hot Sauce Paradigm (HSP) was used to measure aggressive behavior by weighing the amount of hot sauce (in grams) that participants allocate to another participant with an allegedly strong distaste for spicy food. In reality, there is no such confederate who consumes the hot sauce. In order to reduce suspicion, the study was advertised as an experiment regarding videogames, taste preference, and personality. To further reduce suspicion participants were required to fill out a taste preference questionnaire which assessed the participant's preference for five different types of food (sweet, savory, spicy, bland, and salty) on a five-point Likert scale wherein a score of five indicates participants "extremely liked" the type of food and a score of one indicated they "extremely disliked" the type of food (Adachi & Willoughby, 2011). Hot sauce likability scores were used to ensure if preference for spicy food had an effect on the validity of the HSP. The hot sauce implemented was the same mixture used by Lieberman et. al. (1999). The Buss-Perry Aggression Questionnaire (BPAQ) was used to assess trait aggression and confirm the validity of the HSP due to its renowned validity and reliability across many samples (Gerevich, Bácskai, & Czobor, 2007). The BPAQ measures trait aggression in terms of physical

aggression, verbal aggression, anger, and hostility via a seven-point Likert scale wherein higher scores equate to higher trait aggression in the aforementioned sub-scales. The methods and procedures of this study were approved by the Southern Wesleyan University Institutional Review Board and participants were told the true purpose of the study and paid (\$10) at a debrief meeting scheduled after the experiment was completed.

Conclusions

Neither of the hypotheses were supported by the results. For the first hypothesis, it was expected that participants in the competitive group to exhibit the most aggressive behavior (allocate most hot sauce). Results indicated that the competitive group exhibited more aggression than the cooperative group, but less than the single player group. For the second hypothesis, it was expected that losing the game would be positively influence allocation of hot sauce. The opposite appeared to be; winning was associated with higher amounts of allocated hot sauce. These results are interesting because they do not appear to support either of the aforementioned theories of aggression. Evidence of the frustration theory would have been clear if our hypotheses were supported, but they were not. Social learning theory was not supported either; no relationship was found between the number of in-game kills and allocated hot sauce. Speculation, based on observations made during the data collection that losing the game was related to greater empathy and vice versa in the case of winning the game. Further, two limitations may have contributed to these unanticipated results. First, the sample was rather small ($n = 48$). Thus, the possibility remains that the main analyses of this study did not have the statistical power to detect the effect sizes under consideration. Second, trait aggression was negatively correlated with hot sauce allocation, which indicates that the HSP may have been implemented improperly. Despite these weaknesses, the results of this study denote a relationship between aggression and losing in a video game. This particular finding is significant because, to the awareness of the author, this is the first study to measure the effects of winning or losing a video game on aggressive behavior. Due to the unexpected result associated with this variable (winning the game), the inclusion of this variable in future video game-aggression research is more than justified.

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The Effects of Essentialist Labels on Beliefs About Moral Conversion

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Abstract – *The Aristotelian idea of “essence” (unchangeable natures that people possess) has found its way into discourses about morality and affects beliefs about the possibility of future growth, change, and “moral conversion”. This research will outline how society’s use of essentialist labels excludes the formation of true beliefs about the possibility of “moral conversion”. It also explores the ways in which “moral luck” affects how we label individuals, and how this shapes the psychology of moral judgment and our perceptions about future interactions with an individual. Key points that are considered include the messiness of morality for real-life individuals who are generally considered moral saints, the growing body of psychological research that addresses philosophical theories about moral judgment, and the outlook for future discussions about the role of “moral conversion” in interpersonal relationships.*

Keywords – moral conversion, essentialism, moral luck

Introduction

The idea that human beings can change their thoughts and behaviors is generally accepted as possible, especially with the widespread use of varying forms of cognitive and behavioral therapy. However, this often fails to translate to beliefs about changing the “essence” of the person. If someone is described as a “bad” person, this is meant to identify core qualities that are stable over time and fixed within the person. Labeling people as “good” or “bad” appeals to essentialist attitudes defining the metaphysics of humanity. Essentialist labels affect our views about morality and the possibility of future personal growth, change, and “moral conversion”. The use of essentialist labels excludes the formation of true beliefs about the possibility of moral conversion. If we are fixed in character, and the appraisal is independent of any empirical data assessing behavior, then it would be impossible to alter our behavior in any amount sufficient to be considered a moral conversion. I will begin by revisiting the work of the philosopher, David Wong, on moral conversions. He considered whether moral conversions are possible, and if they are possible, how they happen. I will engage with historical examples of essentialism used in labeling people and challenge how this affected notions of

moral fixedness. I will delve into the social effects of attempting to navigate modern life under the belief in the “essences” of humans, while also advocating the belief that people can change for the better. The role that “moral luck” plays in shaping moral judgments offers some key points of discussion about the distinction between behavior and “essence”. The implications of essentialist labeling in the legal system, field of psychology, and personal relationships will be explored through examples such as: the recent push in school systems to address the issue of bullying through identification and labeling of “bullies”, the justice system’s often conflicting attitude that aims to punish, rehabilitate, and treat juvenile “criminals”, and the use of psychological labels as identity markers (e.g. “That person is totally bipolar”). Finally, I will urge caution against casual use of essentialist labels and address why I believe that being open to moral conversion’s possibility plays a crucial role in fostering healthy social relationships.

Essentialism, Moral Conversion, and Beliefs About Change

The Aristotelian idea of metaphysical essence has had a substantial impact on the way that we frame discourses about personality, free will, and the human ability to affect substantive personal change (Baggini & Macaro, 2012; Bloom, 2004; Bloom; 2010; Gutting, 2005; Stiles & Kaplan, 1996). Essentialist labels become like tattoos, shaped by social conventions and nearly impossible to remove at will. This can create tension because the option of “moral conversion” is never truly a “live” one if the belief in essences holds. Labels that assert an essence create situational beliefs that echo the fable, “The Frog and the Scorpion”; in saying that if a person acts immorally nothing can change their nature. Being labeled as “bad” in an essential sense is a judgment that the person fails to meet the normative expectations in their character, rather than simply in their actions. However, this labeling is often a matter of attaching an essential identity to a person who has been labeled for their actions, and the punishments that they received for “bad” acts (Stiles & Kaplan, 1996).

A “thief” is labeled based on their past actions, but the labels are used as shorthand for the expectations we have for future behavior and our beliefs about the character of the person.

“Moral conversion” is the belief that people can make significant changes in their actions, and they can create a new moral character that is admirable, despite a past record of immorality (Wong, 2011). This stands in direct conflict with the idea of Aristotelian essences. If there truly is an essence that distinguishes people who are criminal, mentally ill, or addicts, then no amount of hard work and personal conviction can change the person. David Wong discusses motivating factors that can propel a person towards a “moral conversion”: attachment, empathy, moral disgust, and the elimination of possibilities that would make immoral choices “live” options. In his discussion of Oskar Schindler, Wong illuminates how a real man whose personality was full of ambiguity and contradiction could will himself into acts of defiant bravery. Schindler would not be described as moral when World War II began, but after watching the Nazis slaughter a toddler and her mother he was affected so deeply that he had to act to save Jews even though it went against the natural instinct for self-preservation. Watching the murder of an innocent child was a pivotal moment that created the necessary motivator for a “moral conversion”.

The motivation for personal transformation, the ability of the person to affect a significant and sustained change in their behavior, and the environmental support for the transformation in behavior are important factors in determining whether we believe a person has had a moral conversion. It is easy to simply categorize people as “good” or “bad”, thinking that a “good” person possesses a morally perfect character, while a “bad” person has a defect in their moral character (Flanagan, 1991). The idea that there exist people who possess a morally perfect character does not necessarily require any sort of religious belief. Mahatma Gandhi, Mother Teresa, and Martin Luther King, Jr. are all individuals who fit the conception of a moral saint. It is important to keep in mind that real-life moral saints are far from morally perfect, and the reflections in *The Confessions of Saint Augustine* are a strong example of the struggle that ordinary human beings face when trying to control their emotions, desires, and behavior (Flanagan, 1991; Goldie, 2012).

The symbiotic relationship between philosophy and psychology has yielded a great deal of discussion and debate about moral judgments, and the psychological processes that underpin them (Cushman & Young, 2009). As the knowledge base

grows with every psychological experiment, the task of understanding how people are assigned labels of “good” and “bad” has taken a number of different paths. Of particular interest to this paper is the path that looks at how people are labeled based on the outcomes of their behavior, and the role that “moral luck” plays in essentialist labels (Cushman, 2011; Nagel, 1979). There can be a significant discrepancy between what a person intends and the consequences of their behavior, but blame and punishment are focused on the “luck” of the outcome (Cushman & Young, 2009). This can be quite problematic because we may not be able to control the situations that we find ourselves in, or the circumstances that led to the outcome (DeLapp, 2013). While we may want to hold a person responsible for past actions, we can also understand that people transform over time (Flanagan, 1991). Who we are at seven years old is a very different sort of person that who we are at twenty, fifty, and eighty years old.

To a different extent, essentialist lines of thinking are dangerous because they can create self-fulfilling prophecies once a person is labeled; the label becomes a part of their personal narrative. There are ways in which an individual can embrace an “essence” and there are ways in which an “essence” is assigned without consent. A person attending an AA meeting introduces themselves to the group through the essentialist label “alcoholic” that they have assumed as part of their identity, which is willing acceptance. On the other hand, a child who steals is labeled “delinquent” or “criminal”, a child who acts aggressively towards other children is labeled a “bully”, all of which are assigned labels that the person has no control over. Self-assigned labels can be used as a tool to help a person change their behavior, as a reminder to be aware of the tendency towards certain behaviors. Labels that are assigned by others can have a very different function, though, because they can be used as stigmata to convey to others that the person is in some way deviant (Stiles & Kaplan, 1996). Sometimes we even use essentialist labels as shorthand, turning personality traits that we deem deviant into amateur psychological diagnoses (e.g. “such a psycho” or “that person is acting schizophrenic”). As humans we are naturally drawn toward essentialist labels, but reflective assessment shows that it can have long ranging societal impact if we collectively use labels to control one another (Bloom, 2010).

Conclusions

Hope and forgiveness hinge on the belief that people can actively choose to make moral choices.

While there are certainly character traits that we can recognize in other people, there is a danger in converting the idea of the person into a living embodiment of a single, unchangeable character trait. This project aims to add greater understanding to the ways that society expresses belief about the human capacity to become better moral creatures, both in our hopes and our doubts. It will also tackle the responsibilities we all share when we choose to exert social control through the act of essentialist labeling. The discourse about “moral conversion” is still in its infancy; sitting at the crossroads of multiple branches within the Humanities and Social Sciences, and further exploration can have a meaningful social impact. The belief in the possibility of “moral” conversion plays a crucial role in interpersonal relationships because it is the belief that we can transform one another and ourselves that allows us to have hope for the future and forgive one another for past moral failures.

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Jurors' Judgments About Recanted Confessions

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Abstract — Confession evidence presented at trial is very compelling and persuasive evidence of a defendant's guilt. When a confession is recanted by a defendant, jurors have to make judgments about the credibility of the defendant's story. Because it is difficult for laypeople to believe that someone would confess to a crime that he or she did not commit, many jurors have a tendency to harshly judge the recanter. The present study examines the impact of a recanted confession on jurors' judgments as a function of crime severity. Participants were asked to read a case involving a defendant charged with either aggravated sexual assault or burglary which included either no confession, a confession, or a confession that the defendant later explained was given falsely due to the intensity of the interrogation. They then made judgments about the defendant's culpability, sentencing, and other case-related questions. This study is currently ongoing; it is predicted that defendants who claim their confession was false will be judged more harshly by mock jurors than those who claim their confession is true, particularly when the crime is severe.

Keywords — Confessions, recant, legal system, psychology, jury decision-making

Introduction

A confession offered into evidence by the prosecution during a criminal trial is very compelling, and serves as persuasive evidence of a defendant's guilt (Henkel, Coffman, & Dailey, 2008). Research has shown that confessions have a greater impact on mock jurors' decisions about a case than other form of evidence (Kassin & Neumann, 1997). Even when evidence is proffered during trial that a confession is untrue, confessions remain overwhelmingly prejudicial in the minds of jurors. This exact scenario has been shown to lead to many wrongful convictions of innocent people (see www.innocenceproject.org). Even when mock jurors recognize that police interrogators used coercive tactics to elicit a suspect's confession, this information has little impact on their judgments (Kassin & Sukel, 1997).

The supposed presumption of innocence in the legal system leads many individuals who stand accused of a crime they did not commit to believe that truth and justice will ultimately prevail over a false confession (Kassin, 2008). This assumption has led to many innocent people to cooperate with

police, waive their Miranda rights, and speak openly and freely to police interrogators. Once a confession has been captured from a suspect, a judge must determine whether the confession was given voluntarily and is admissible as evidence during trial. Then a jury, hearing the admissible evidence, must determine whether the defendant is guilty beyond a reasonable doubt. Unfortunately, jurors are often unable to distinguish between a true versus a false confession (Kassin, Meissner, & Norwick, 2005). This research also finds that even trained police investigators are able to correctly distinguish between true and false confessions only about half the time. Misjudging confessions in this way often ignites a chain of adverse legal consequences for the accused.

Confessions that are given by a suspect only to be later recanted often corrupt the truth-seeking process by which justice is administered by tainting the evidence on which the judge and jury render judgments of guilt. For example, research finds *corroboration inflation* in jurors' judgments of guilt – the notion that confessions taint further incoming evidence from witnesses and forensic experts by producing an illusion of support (Kassin, 2008). The law instructs jurors to evaluate pieces of evidence presented during trial as independent entities, but confession evidence is held in the highest regard and perceptions of all other evidence presented after this are skewed by the obviously prejudicial nature of a confession. Many people tend to find a confession to be incriminating even in the face of evidence indicating it is false.

Recent research on confession recantation has captured the attention of legal psychologists. For example, Henkel (2008) examined whether the believability of a recanted confession varied as a function of the reason provided for it. Mock jurors were more likely to believe the defendant to be less culpable for the confession when it was based on an underlying medical (physical) condition rather than a mental condition/illness. Redlich, Kulish, and Steadman (2011) found that false confessors were four times more likely than true confessors to receive a prison sentence as a result of the crime for which they were accused. Also, those who recanted their confessions, whether true or false, were found guilty four times more often than those that did not

recant. The present research extends these findings to specifically examine mock jurors' judgments about a defendant who recants his confession and explains to the jury the circumstances (aggressive interrogation techniques) that led to his falsely confessing to the crime. This study also examines whether mock jurors' judgments concerning recanted confessions vary as a function of crime severity. It is predicted that defendants who claim their confession was false are judged more harshly than those who claim their confession is true, particularly when the crime is severe.

Method

Participants, Materials & Design, and Procedure

This study is ongoing. Participants are Wofford College students and staff. They read one of six fictitious trial summaries, each of which was approximately a page long. The first variable manipulated in the trial was the severity of the crime: participants read about either a case involving a man charged with aggravated sexual assault or charged with burglary. In both cases the crime took place at an apartment complex and there was only one eyewitness (who was also the victim in the sexual assault case) to the crime. The second variable was the confession evidence, manipulated in three ways: the defendant did not confess to committing the crime, did confess to committing the crime, or confessed to committing the crime but then later recanted the confession and explained to the court that the mental stress from the interrogation caused him to falsely confess. In all cases, the defendant pled not guilty at trial.

Following informed consent, participants were asked to read one of the six versions of the case summary, then fill out a questionnaire including items pertaining to the defendant's culpability, sentencing, case strength, defendant and witness credibility, and validity of the confession. They also answered some demographic questions. Afterward, each participant was debriefed and thanked for their participation. The study took about 15 min. for each participant to complete.

Conclusions

Overall, this research fills a gap in the literature by providing information about how people judge confession evidence that has later been recanted due specifically to coercive interrogation techniques. This is an important area of study given the growing number of wrongful convictions discovered that are based on faulty confession

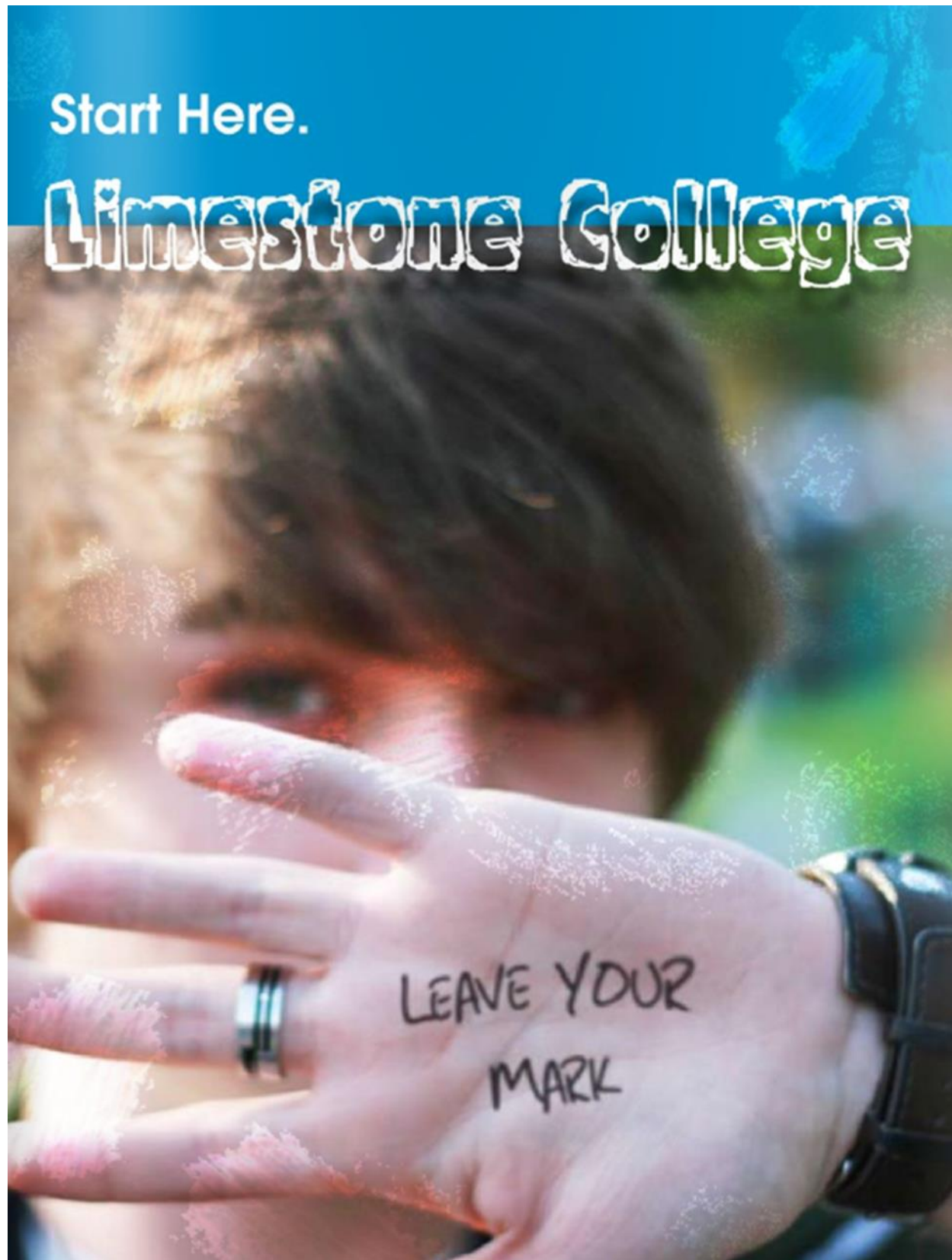
evidence. This research also sheds light on the negative consequences of coercive police tactics.

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A Return to the Living

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Abstract – *What's it like to undergo a stem cell transplant? It all depends how you look at it.*

Keywords – Hospital, cancer, stem cell transplant, humor

Everyone gets sick but not everyone writes about it. When we do such work it is known in the writing business as pathography. Such tales of illness might detail bipolar disorder or Karposi's sarcoma or Lyme disease. I write about an incurable blood disorder because that's what I've been dealt. In particular in the following essay I write about the most radical treatment for that disease, a stem cell transplant, because there aren't many records of the procedure from the patient's point of view.

The erasable white board on the wall is blocked out into its essential rectilinears: Diet, BP, ♡ Rate, Temp, first name and pager number of the nurse on call, name of the tech who takes my vital signs, name of my doctor, and under Plan for the Day someone has written in bold black marker: URINE. As if the entire object of my day were micturition. In some ways that's not far from the truth. Your urine of course says a lot about you. Of first importance is that you have enough. On each occasion it is my responsibility to drag my IV tree after me into the bathroom and piss into a graduated receptacle, measure the results, and record in the designated rectangle my production in milliliters. Soon I'm bored by the whole process. I suppose the fact that my kidneys still functioned should have meant consolation and relief but in the doldrums of disease I had little energy for thinking of life without them.

Obviously, I'm here because I'm sick. Who else but the ailing would spend their days indexing URINE? In fact, I and my fellow sufferers are sufficiently sick and numerous to merit a special wing of this hospital. Five West is devoted to folks whose bone marrow makes the wrong stuff. In my particular case my body is trying to kill itself and me by producing cancer alongside its blood. The current remedy of choice is to destroy the misbehaving matter and restart it with an infusion of better behaving cells, a stem cell transplant.

You don't find yourself leaning against the tile of an institutional bathroom, a piece of plastic

shaped to its peculiar function in your other hand, without some advanced planning and some preliminary stages. Before infusion and transplant come stimulation and collection and so more than a year before I had arrived at the hospital for that purpose. On an August dawn while waiting to check in I rested on the ground-floor desk at Registration and felt the laminated wood thrumming under my palms as if with all the excited plasma entubed in every florescent light overhead, as if the entire edifice thrilled with all the weight and all the motion and all the heart's blood pulsing through the ten stories stacked above me. Collection means coercing the marrow to do something with the heart's blood it doesn't really want to do—proliferate and release embryonic cells so that they may be filtered and captured from the stream, then stored in cryogenic deep freeze until transplant. Some patients have an easier time with this than others. They take the mobilizing shots to stimulate the marrow to produce and free these stem cells, show up in the right room in the maze of the fourth floor, have a fairly large access needle put in one arm, and lie in a bed for five hours watching their blood drawn into a machine whose four cylinders whisk it into a salmon bisque that drips into plastic bags while the unwanted blood flows back through the return needle in the other arm. Two or three days of this and they've collected the three million cells required.

On a number of levels this didn't work for me. The first mobilizing drug having failed I had to inject my thigh with a second that provoked the very intriguing and perfectly superfluous consequence of dark and clashing nightmares. It was as if I spent the hours between midnight and six in a black box accompanied by a brass band that dueled with their instruments like fencers while somewhere in the dark nearby an unseen and rancorous foe upended drawer after drawer of silverware onto a tin floor. After four nights of such concerts and four days of weary reclining I had only about two million cells chalked up to my credit, which meant that I'd have to return a few months later and try again. Among the hexes of lying more or less stock still for the best part of the day for several days on end was that as soon as I had the needles lodged in the vicinities of my elbows and so

couldn't bend my arms for five hours my nose began to itch or my scalp or some random speck inevitably found my eye. The wall clock beside the bed buzzed the moments by and I would be startled sometimes to look up and notice that a whole seven or even eight minutes had passed. Every quarter hour the blood pressure monitor would sound and inflate the cuff around my right calf and sing its dead two-note tune signifying the final numbers had been reached. I spent my recumbent time day-dreaming or speculating, making mental lists of Christmas presents to buy or medical bills to pay while the red second hand gave the clock face another close shave, thought up books to read, listed titles read, sang in silence old songs from the radio of my first car, listened to my mind recite all the poetry I had by heart. By then it was nearing nine o'clock and I had only a little more than four hours to go on day one.

They want you to have three million cells as a safety net, a redundancy in the system. For best results the industry standard is a million and a half so if the transplant fails to take they've got a second set of plastic baggies to try again. All of this is tagged in deep freeze especially for me awaiting the morning I'm admitted so that wearing my fetching hospital gown and ensconced in my hospital bed they can without delay commence asking me a good many questions, convey to me a good many statements, have me sign a multitude of forms of which I get to keep the yellow carbons but not one declares what Plan C will be if the second transplant becomes necessary and also fails. I don't inquire, have never done so in all my previous consultations. Instead I'm lost in the staff's efficiency and good cheer, gurneyed as if I were a satrap in a sedan chair to an elevator that rides me down to an operating room. They all know exactly what to do and I have no idea what to expect. When the doors part a nurse tall and blond and smiling tells me I'm eligible for Happy Juice. Within moments of a sharp prick I detect a surge of joyful fellow-feeling that makes everyone in the OR my dearest relatives, including the blue-capped doctor who introduces himself and who looks like he might very well be playing hooky from tenth grade today. This doesn't deter him from incising the skin under my left bicep and inserting a tube forty-four centimeters long into my vein and working it down to the right atrium of my heart. I get to monitor its travel on a screen so grainy it looks like it's coming to me on a television set via satellite circa 1968. At the moment, happily juiced, I give no thought to the fact that through this thin line will come the poison that's destined to kill my marrow and might kill me, to be followed by the cells that, fingers crossed, would save me. At the

moment I genuinely give no thought to anything I can now recollect.

Not until the next morning does the true process really begin, between breakfast and lunch. The whole procedure is quick and straightforward. While the patient reclines in his hospital bed the nurse connects a fat syringe containing a clear solution to the line and depresses the long plunger slowly, as if this is a crotchety detonator and she's preparing for a careful explosion. She does the same with a second syringe. The patient meanwhile devours as many popsicles as he can hold because there's anecdotal evidence in the medical community that keeping the mouth and tongue cold retards the development of seeping sores that are a reaction to the solution and can plague the patient for days or weeks. I manage to consume ten in rapid succession, mostly purple with grape flavoring. Afterwards there's no turning back. The clear liquid is melphalan, $C_{13}H_{18}N_2O_2Cl_2$, a high-dose chemotherapy drug of which the mechanism of action is reduced to a sole purpose: lay waste to my marrow. It's like being bitten internally by a snake whose fangs inject venom with a single risky antitoxin, the sovereign remedy of my own returned cells, and yet the whole time the plungers are disappearing into the syringes I have absolutely no sensation of the drug's entrance into my heart, its distribution around my system with each pulse. I feel no ill effects though in the coming days that will change. In the meantime I'm admonished to keep moving if I can and told that nine circuits of the ward constitute a mile.

The doors I pass are closed, several posted with warnings about hazards and hygiene or the total prohibition of guests. Where the doors are open the rooms are mostly dark. If there is conversation it carries on in murmurs. I'm surprised at how the suffering make no noise at all, 586.67 feet without wailing, without whimpers, round after round with only the beeping lights in machines or the wheeze of respiration. From one lightless room all that is visible is the bandaged stump of an amputee's missing leg. At the edge of the ward, a carpeted space beyond the linoleum tiles with easy chairs, magazines, a view of the city at dusk through vast windows, a patient sits alone in a wheelchair trellised with chrome branches bearing seventeen unbelievable IV bags, the fruit the color of water.

Stem cell infusion begins the next day, again between breakfast and lunch. The Cryo Lady—even the staff call her that—trundles in with a cart on which sit a blue cooler just like you'd use for picnic beer and a metal box about the size of the cooler. In the box she begins to heat tap water and into that submerges the bags that I haven't seen in months and that contain what has become more precious to

me than molten gold, the pale pink fluid now resembling a weak strawberry milkshake that's probably gone slightly off. My nurse lays out another dozen large syringes and over the course of the next ninety or so minutes draws the fluid from the dripping bags ranked along the counter and gently sends it down the line. She tells me that the preservative mixed with the stem cells has a peculiar odor that always becomes manifest when the infusion starts. I can't smell it even though it must be exuding through my pores but apparently everybody else does, especially the nurses. To some it's like stewed tomatoes, she says, but to her it's always very definitely the whiff of garlic and summons a craving for Italian food.

As I lie up in bed very nearly twiddling my thumbs the Cryo Lady continues to dip the bags in hot water while the nurse carefully dispatches my thawed cells on their pilgrimage. The two of them discuss their tailgating plans for Saturday's big game, their beloved and aging pets, their car repairs, their troublesome children and querulous and aging parents. Before the second syringe is empty my nurse is frisking her pockets, produces her cellphone. "I'm sorry," she says. "I've got to call my husband. We're going to go to Olive Garden tonight." During my own dinnertime a nurse leans at my doorjamb and says, "Smells like somebody had a birthday." "I'm sorry?" She says, "I smell garlic. You celebrating a birthday?"

And that's how I learn of the transplant unit's tradition of alternative birthdays because once the melphalan goes in there's no exit except death or resurrection. The snake has struck and now it's be reborn or die. The transplant is a return to the living then, your one chance for a second chance heralded publicly through the wide corridors by the strong waft of garlic cloves. Before long the kitchen sends up a thin wedge of birthday cake with a single candle. The next week on Day Nine when my scalp begins to edge towards nakedness I do take on the look of an overgrown newborn. I no longer need to shave. With no hair in my nostrils my nose drips like a bad faucet. But these are comparative inconveniences. The true scourging occurs in the darkness of the body where my blood counts plummet toward absolute zero. The melphalan does its work superbly. Platelets that clot the blood, white cells that fight infection, red cells that carry oxygen to my organs and tissues, they almost disappear from circulation. And then the waiting begins, the vigil to see if the stem cells engraft within the caverns of my spongy bones and bring me back to life, bring life back to me. The interim is a tortuous limbo with a set of phenomena special to the place. Because in addition to the ulcerous eruptions the melphalan does a meticulous job of

suppressing the operation of the taste buds, those who enter here abandon all hope of the savor of flavor unless they're fond of the taste of metal. I become a masticator, a ruminant, the lump of food at my jaw no more salt or sweet than a cud of paper. The purple popsicles and birthday cake are a distant memory. If my many pills morning, noon, and night didn't require a bed in my stomach I'd just as soon skip meals because each contraction of the throat muscles seems to ride over a trail of broken glass from the root of the tongue to the Adam's apple and deeper beyond the sternum. If you could swallow the static from your radio and television it might go down like this. The canals of the ears ache after a similar fashion but it's merely the rawness inside of your skin, mucositis, the proper and prickly term for the bursting of cells that compose the mucous membranes and that 80% of patients experience.

Early each morning I'm carted to the blood lab to see how my counts are progressing. If I'm in dire need I'm hooked to an IV in a room with others in similar condition but we don't really commune. Everybody con-centrates on the bags over his head or tries to doze in the adhesive vinyl recliner provided. The wall is mostly glass so it's possible to look through to the nurses station. Most of the computer monitors are tuned to the website of a department store advertising a shoe sale. The nurses scroll through pages of flashy red pumps, little black numbers with the thinnest of straps, the narrowest of heels. The other patient in the room, a leukemia sufferer, has come in complaining of terrible nausea and continues to complain until the sedative puts his white head to sleep. I notice for the first time that the shock of the melphalan has dug a curving trench from edge to edge in the enamel of my fingernails. When he wakes I'm still there watching the bag of platelets yellow as saffron drip into my arm. He rises from the recliner more easily than he slumped into it and bids me "Adios." I reply, "Hasta la vista." He hesitates for a moment before turning to nod a smile at my optimism but in our coming and going this is the only time I see him.

As before, and even more aggressively now as my counts slowly bend their trajectory from zero, I'm encouraged to take the air, to smell the salt sea, and eventually I feel minimally capable of an outing to forestall the walls closing in. A local bookstore suffices; I feel vaguely equal to the concentration that text requires. Coming through the doors I draw stares and why not? To most eyes here I must resemble a shuffling corpse cancelled from primetime television or hauled fresh from the tomb in search of summer reading. My pate has only the merest claim to hair, my face has recovered a state

of prepubescent innocence could they but see it beneath the powder blue surgical mask I sport, and dangling out of my sleeve is the vital tubing still in place. I approach the clerk and ask for a particular title released only a few days before. After a glance over the counter he keeps his eyes to his screen and keyboard. Even when he says, “Yes, we should have that right over here,” he doesn’t lift a lash my way but leads me directly to the correct shelf. The only hint of discomfort is the pace he sets and that I strive to match, the fingers that pluck the book of essays I’m after, the cool hand that delivers it into mine all without another glance, the departure at just as quick a pace. I wonder what tales he may tell at lunch break, over dinner that night. Will he say, “Let me tell you about this guy I saw today”? I would. I just have.

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Concepts of Agrarian Freedom in the Americas

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Abstract – *Early 19th C. African American intellectuals looked back on the Haitian Revolution to imagine a concept of agrarian freedom—a nascent theory of environmental and economic justice that connects their rhetoric to that of Native Americans and to the foundational white environmentalists of the nineteenth century. To better understand agrarian freedom, I juxtapose the writings of Northeastern black intellectuals like Prince Hall, Prince Saunders, and Frances Watkins Harper with the speeches of Six Nations orators as they demanded sovereignty and land rights. For people of African descent, what was worth fighting for in the American or Haitian Revolutions had much in common with what members of the Six Nations struggled to maintain in the early republic: the right of independent freeholders to sustain their communities through a cultural sense of belonging.*

Keywords — African American history, rhetoric, Native American history, environmentalism

Introduction

Thomas Jefferson is perhaps the most iconic democratic agrarian in United States history, yet my work reconsiders the ideals of agrarianism in the Americas from a different perspective. Beginning at the end of the eighteenth century, a series of African American communities attempted to put a radical form of democratic agrarianism into practice, building settlements that expanded from Canada to Sierra Leone and, eventually, Haiti. At the same time, indigenous nations such as the Cherokee and Seneca converted the landscape of their ancestral homes to communities that likewise fulfilled democratic agrarian ideals of progress and productivity. In a New World where resources abounded, many revolutionary-era Americans believed in the freedom and equality that the life of a yeoman afforded. This ideal of freedom differed from Thomas Jefferson's celebration of yeomanry. For these small-scale farmers, freedom was integrally connected to land—to the natural world—rather than to an abstract set of political ideals or the protection of the social contract. While elites advocated an enlightened concept of education and rational governance as the path toward freedom, that path started elsewhere for the people. Thus when Hudson Valley farmers chose sides in the war against England, as Staughton Lynd points out, they based their decision on a practical material matter rather than the ideological inspiration of the

Philosophes. They fought for the side that was most likely to reward them with property so they could “realize the American dream and become the owner of the land that [they] cultivated (Lynd xi). African and Native American ideals of land ownership offer an additional perspective that enriches and expands upon Jefferson's idea of agrarian democracy.

Literature Review

The project compares rhetoric about land rights and freedom, bridging African and Native American studies with American literary history. It builds on important recent interventions in the relationship between black agrarianism, work, and the natural world by Kimberly Smith and Kimberly Ruffin. While recent work by Ian Finseth and Lance Newman has also opened the field of ecocriticism to African American studies, my study is unique because it brings Native American history into the conversation. It builds upon Matthew Dennis's work on Seneca struggles for sovereignty and Timothy Sweet's analysis of the ways that the Cherokee legitimized their title to land. The scope is also transnational because there are parallels between the way Haitian freedom fighters, African American revolutionaries, and the First Nations negotiated their right to agrarian freedom and territorial sovereignty by shedding their “hearts blood for its possession,” both through military service and agrarian labor.

Cross-Racial Dialogues

This project, which will be my second book, considers the aspects of agrarian freedom in Native and African American intellectual and activist traditions that emerged before 1830 alongside writings by white authors, tracing the evolution of the idea of agrarian freedom and natural equality in the early national era to the utopian agrarian movements that gained momentum in the two decades before the Civil War. By the 1840s, many literary figures who participated in or supported utopian communities—including Margaret Fuller, Ralph Waldo Emerson, the Alcotts, and James Greenleaf Whittier—were also immersed in the era of reform's campaigns for indigenous, African American, and women's rights. Connecting these developments, my project outlines a tradition of

democratic agrarianism in the United States through the lens of black and indigenous history, then illustrates how white reformers drew from the immediate historical experience of the black and indigenous Americans whom they often worked with and wrote about.

The Challenges of Agrarian Freedom

During the American Revolution, black loyalists—free blacks living in New York and New England as well as escapees from Southern slavery—fought on behalf of the Crown in hopes that the king would grant them land allocations for their service. Having cast their lot with the losing side, they emigrated to Canada after the revolution. Perhaps they understood that the people, whether under the power of a King or a quasi-aristocratic president, were not free if they could not fulfill their needs as human beings independently. The agrarian ideal of freedom offered this type of independence, and while Lynd argues that “the purpose of society is not the protection of property,” (xxvi) I would argue that the fulfillment of the rights of each human being is the purpose of property itself. Property, as the foundation of the agrarian ideal, motivated early Americans and helped usher *the people* into a position of political significance. This reality was not lost on black loyalists or on the free black men and women who struggled for their rights in New York State right up until the Civil War, nor was it overlooked by members of the Six Nations (Iroquois) as white speculators encroached on their lands. I propose, then, that real property—not just property in the laboring body—undergirds an American intellectual tradition with revolutionary roots. This tradition is truly *of the people*—including African and Native Americans as well small-scale backwoods farmers of European descent who were not affluent traders or aristocrats.

My research suggests that African American agrarianists not only looked to Sierra Leone or Haiti as a possible place for settlement, they also observed and commented on First Nations struggles for sovereignty. At the same time that African Americans known as Black Loyalists were setting up a new colony in Nova Scotia to fulfill their idea of agrarian freedom, ongoing negotiations and struggles between the Seneca Nation and the United States government that followed the Treaty of Canandaigua (1794) marked the difficulty of maintaining an indigenous form of agrarian freedom within United States. Archival materials in New York State document the ongoing struggle for Seneca agrarian freedom in particular. Much like the Cherokee, who established farms, a

constitutional government, and even their own newspapers to prove to the United States government that they were “civilized” and deserved to remain the sovereign proprietors of their land in North Carolina and Georgia, the Seneca people worked to build a system of “civilization” that the government would recognize and respect. Focusing on the rhetoric of Cornplanter, Handsome Lake, and Red Jacket as well as versions of Seneca legend that were recorded and translated into English in the nineteenth century, my work describes the evolving definition of agrarian freedom that developed as the Seneca created a rhetorical stance of resistance to land appropriation and Indian removal.

Conclusions

Struggles to maintain or attain sovereignty and land rights in the face of United States government encroachment characterize the histories and discourses of Native and African American communities in the revolutionary and early national eras. I first compare the concepts of freedom that emerged from those struggles and were voiced by the Six Nations and fought for by the Black Loyalists, then argue that white reformers and utopian thinkers immediately before the Civil War built on similar tenets of agrarian freedom.

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La Transformation de la Femme Migrante: du corps enfermée à l'esprit libre. À partir d'*Inch'allah Dimanche* de Yamina Benguigui

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Abstract — My abstract entitled, “*La Transformation de la Femme Migrante: du corps enfermée à l'esprit libre. À partir d'Inch'allah Dimanche de Yamina Benguigui*,” is an exposé of Yamina Benguigui's autobiographical novel, *Inch'allah Dimanche*. It explores a self-searching exile of Zouina, an Algerian immigrant woman in France, whose attachment to Muslim tradition is challenged when she starts an escalating rebellion against her native culture and in the end, achieves a liberating physical and spiritual metamorphosis.

Keywords — French Studies, immigration, feminism, Islam, literature

Introduction

The following paper is a segment of a 15-page research paper I submitted as a part of the application dossier for French PhD programs, and is a product of research done in FREN398, Topics in French Language or Literature: The French Republic and its Discontents. As a senior English Education major at University of South Carolina Upstate, I currently work as the French tutor in the World Language Lab at USC-Upstate and as a research assistant for Dr. Araceli Hernández-Laroche. In addition, I maintain a 4.0 GPA and was rewarded with the UPS General Scholarship and the International Scholarship (Fall 2013-Spring 2014, worth \$11,378). I will graduate this May and will be enrolled in a French PhD program for fall 2014. I have so far received four offers respectively from Ohio State University (PhD in French), UNC-Chapel Hill (PhD in Comparative Literature), and USC-Columbia (Ma in Comparative Literature).

And on the Seventh Day God Granted Relief

Plot Summary

Inch'Allah Dimanche, or “Thank God for Sunday” is a moving exploration of the dilemmas Zouina faces, an Algerian immigrant in France, faces and her unrelenting struggle to gain freedom and independence, both physically and spiritually, from what she perceives to be her restrictive Algerian Islamic immigrant culture. The narrative occurs during the “Family Reunion” law in 1974,

when the French government decided to allow the families of Algerian men working in France to emigrate to join them. Upon arriving in France with her three children, Zouina quickly realizes that she is prohibited from leaving the house. Friends and family constantly kept her under surveillance, particularly her mother-in-law. Zouina only finds relief on Sundays, when her husband takes his mother out for the day, and thus she is able to explore the real France existing outside her grasp. As the days pass, she finds herself struggling between traditional Algerian values and the rapid feminization and modernization of France. She views her arrival in France as both a bitter experience of exile from her family paralleled against an unexpected journey of self-discovery.

Bibliographical Context

Drawing on her own childhood recollections, Yamina Benguigui paints an evocative and painful portrait of a young immigrant woman and her experiences in a new culture in order to encourage Algerian women to confront similar challenges and fight for autonomy and independence. As Benguigui tells us, “I wanted to recount a moment in the history of the immigration of Algerian women in France, the mothers of today's second generation, in an intimate, moving and above all sincere way.” *Inch'Allah Dimanche* emphasizes Zouina's sense of entrapment in a new world, isolated from all of her friends and relatives and all while forbidden to leave home. According to Benguigui, “In France, she's in prison. It's at the end that we see Zouina's true face, her true identity. What the book depicts is her first tottering steps towards her own liberation.” In this heartwarming dramatic comedy, the author skillfully paints a portrait of one female Algerian's experience, expansive enough to inspire and encourage people in all walks of life.

Narrow is the path to freedom

The focus of my paper is to analyze the process of Zouina's emancipating transformation by examining the impact different characters have on her and comparing and contrasting the different

roles of differing women in her life. To gain her autonomy and independence in the new world, Zouina has to overthrow the suffocating oppression of Aicha, her mother-in-law, and Ahmed, her husband. The former symbolizes the conventional Muslim values and the resistance to cultural integration; and the latter represents Muslim patriarchy that has kept Algerian women in the shadows throughout history. Both characters are very interesting due to their contradictory natures. Being a victim of the traditional values herself, Aicha turns out to be a steadfast defender of the oppressive culture. Depicted as the epitome of Algerian men, Ahmed is abusive and tyrannical, however, these 'qualities' suggest his insecurity due to his inferior social status as an immigrant Algerian worker and his awkward predicament of differing roles in life. On one hand, they are the biggest obstacles Zouina must overcome to realize her transformation; on the other hand, their maltreatment, and brutal oppression solidify her determination to embrace the new ideas and to strive for her self-actualization.

In Simone de Beauvoir's view, "Woman's drama lies in the conflict between the fundamental claim of every object, which always posits itself as essential, and the demands of a situation that constitutes her as inessential"(Beauvoir 2009:17). In the novel, the old mother-in-law Aicha and the young wife Zouina, are confronted with this very dilemma: on one hand they live in a patriarchal family structure that severely limits their mobility; on the other hand, in the society they migrated to, women are demanding and gain greater freedom. While Aicha never ventures outside on her own, Zouina will. The patriarchal constructs of the mother-in-law have become an organic part of her essence and therefore irremovable and invisible to her; however, for Beauvoir, to give consent to the deprivation of one's freedom would be a considered a "moral fault". On the contrary, Zouina experiences the outside world as a space where she can explore and expand her freedom, as a transcendent space. Sadly, although both women have suffered in a prison behind bars of social sexism, the elder has languished for so long that she does not perceive her bars as limitations; instead she considers them a source of solace, which renders her an unwitting guard of the prison.

'Sisters' in arms

Another combination of characters, serving as foils to the protagonist, is Nicole, Zouina's French neighbor, and Malika, her Algerian compatriot. In the novel, the changes in sexual mores and women's condition, which were sweeping across French society, are represented through the

friendly character of Nicole. The propagation of the 'popularized' version of Simone de Beauvoir's ideas is evident when Nicole makes a vague allusion to *The Second Sex*: "I have to bring you the book of that woman. This woman says we need to manage our own sexuality. Your body belongs to you" (Benguigui 122). The encounter with Nicole challenges and undermines Zouina's previous education and beliefs of traditional Algerian-Muslim culture. Malika is both the mirror and the contrast of Zouina. She has been in France for 15 years and like Zouina, she has built her life around her husband and her children; however, she sticks to the traditional values and never exposes herself to new perspectives. She creates her own prison and enslaves herself. Malika's experience offers a possible prediction for Zouina's future and makes her realize the tragic consequences of her submission. Her bitter rejection symbolizes Zouina's rupture from her traditional Algerian views on the power dynamic between men and women, and the debut of a brand new life.

Conclusions

Despite the heart-wrenching start, the story has a positive and hopeful ending, which is marked by the finalization of Zouina's liberating metamorphosis. The protagonist's courage and perseverance gained respect and understanding of her husband and the powerful ending of the novel strikes a chord of hope in the readers, "Tomorrow, I'll take the children to school". In addition to the mastery comparison and contrast between characters and the meticulous attention to domestic details, the novel's artful and meaningful structure and soulful writing style enable the reader to understand better the bittersweet journey of Zouina. The theme of immigration is reflected in its structure: *le depart* (the departure), *l'arrivée* (the arrival), and *la rencontre* (the encounter) are the three parts which manifest what Benguigui believes are the three integral phases of the cultural assimilation for most immigrants. The story of Zouina revolves around departure and abandonment, arrival and exile, bitter memory and sweet prospect, and rejection and acceptance.

As a female Chinese living in the U.S., I can strongly relate to Zouina's experience. The novel touched me because it deals with immigration and the fate of minorities. I find the transformation of the protagonist fascinating and her search for self among different cultural streams inspiring. Zouina is beautiful not because she is young and pretty, but because she is courageous and determined. Through this novel, Benguigui gives homage to the pioneers of immigration who confront the

challenges related to integrating into new communities, stay open-minded to new perceptions, and fight against discrimination and oppression.

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When Reality is Stranger than Fiction: *To Kill a Mockingbird*, Race, And the Scottsboro Boys

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Abstract — Harper Lee's, *To Kill a Mockingbird*, uses a tragic trial of a falsely accused African American to not only depict the way of life in the 1930s, but to also symbolize the changing times. She uses the perspective of a young girl to demonstrate the racial discrimination of the time period. The story is set in the Deep South in a time when sharecropping was popular and work was difficult to find due to the Great Depression. The setting underscores the townsfolk's prejudice against Tom Robinson which diffuses into the judicial system. The Scottsboro Trial of 1933 resembles the fictional Tom Robinson's case in many different aspects. This particular trial proves that the treatment towards African Americans was no different in the courtroom than it was in society. Just as the trial in *To Kill A Mockingbird* symbolizes the challenging of racial boundaries and their code of conduct, the Scottsboro Trial marked the change in the judicial system towards other races. My argument will be based on how the novel threatens the racial boundaries set in the South and how the Scottsboro Trial is an example of the racial movement that was taking place.

Keywords — Race relations, history, literature

Introduction

It is unknown whether Harper Lee knew her most famous novel, *To Kill a Mockingbird*, would be so well recognized not only for its symbolism, but also by the way she demonstrates the behavior of society and how their mindset negatively affects people. She took the prominent issues of the Great Depression, one of which was racial prejudice, and presents a more personal perspective from one man in particular: Tom Robinson. Lee's novel portrays the mindset of the Deep South in the 1930s and how the ideas there carried into the workings of the state's judicial system. The novel may be fiction, but it mirrored similar cases such as the Scottsboro Boys Trial and the Martinsville Seven, and thus represents an important historical reflection of the Depression era.

The Tom Robinson Trial

The trial of falsely accused Tom Robinson serves as the focus of Lee's novel. Robinson was lured by Mayella Ewell. When he tried to get away, he was accused of raping her instead. Though

Robinson's lawyer Atticus Finch defended him, Atticus knew all along how the court case would end. The court, much like the people of the town, was quick to take the word of a "white" man and woman over that of a "black" man. Though there was specific evidence from Mayella's injuries proved Robinson's innocence, due to Robinson's race the twelve white men of the jury had already found him guilty before the trial even started.

As Robinson awaited his trial, a mob of angry Caucasian men swarm the jail where Atticus was watching over him. Scout, the narrator, deducted by the tones of voices that "somebody's man would get jumped" (Lee 152). Lynching with and without justification was common practice in Southern states. In the study *Alabama: The History of a Deep South State*, William W. Rogers explains that though the Civil War brought about change through industry, "the old verities and the old arrangements stayed the same" (226). Restaurants segregated and African Americans were expected to humble themselves and respect Caucasian men. Refusal to do so would result in humiliation and violence. Alabama, being a part of the Deep South, "accepted the war's political verdict" but did not promote social change (226). The South seemed to consider the idea of independent and free African Americans as unethical.

To Kill a Mockingbird Analysis

To Kill a Mockingbird is set in the mid-1930s during the peak of the Great Depression. The Southern states were especially hit hard by the economic downturn. Briefly, blacks and whites had come together in order to survive economically, but according to Claudia Durst Johnson "the desperate unpredictability of the economic situation, competition for jobs, and long standing racial fear reinforced bigotry" (4). Though the Great Depression had the potential to unify ethnic groups, it instead increased the racial tension because now Southerners felt like they were competing with an inferior people for the same job. Johnson also claimed that World War I had an impact on prejudice. Instead of the war "enlarging the field of tolerance," soldiers merely returned

with an “increased sense of superiority and fear” when faced with other cultures (4). War taught them to be intolerant of the enemy. In America, the enemy was the African American. They failed to learn to see equality among different cultures, and this mindset translated into the people of *To Kill a Mockingbird*'s Maycomb, Alabama, as it did for states in the South.

In the 1930s through the 1960s, when *To Kill a Mockingbird* was published, African Americans were expected to follow an assumed code of conduct outlining legal and social boundaries that Lee expressed in the novel. These boundaries revolved around gender, class, region, and tradition (Johnson 31). As was tradition in the Deep South, the region influenced the degrading opinion of “blacks”. In *To Kill a Mockingbird*, Tom Robinson and his accuser Mayella Ewell are in similar classes. Mayella, knowing that both she and Tom were poor felt more comfortable around Tom because she did not feel too different from him. She proceeded to invite him inside her family's fence to do odd jobs. Robinson merely follows the socially-accepted code of conduct by generously giving her help with chores. By doing so, both pushed their social boundaries, which led Mayella to take advantage of his courtesy. As soon as her plans fell apart, she turned on Tom by using the race stereotype to hurt him. She knew that the town's prejudice and the law would contribute to her story.

The infamous trial of the Scottsboro Boys has been often connected to that of Tom Robinson. On March 25th, 1931, nine young, African American men were arrested and charged with raping two Caucasian women on a freight train (Johnson 5). On this freight train, a brawl occurred between several Caucasian men and the African-American men. Most of the former were thrown from the train, forcing the police to wait for the African American men when the train came to a stop in Paint Rock, Alabama. The parallels corresponding to both cases included “the threat of lynching; the issue of a southern jury's composition; and the intricate symbolic complications arising from the interweave of race and class” (Johnson 5). The people of Alabama as well as the jury, who consisted of all Caucasian men, wanted to see the accused rapist executed. The women in the cases came from the lower class, and some historians argue that they may have falsely accused their attackers to cover up a different crime. Atticus Finch hinted that Mayella's father may have been the one who inflicted her injuries and pointed out that he was left handed and her bruises were on the right side of her face. An article in the *New York Times* written by F. Raymond Daniell describe the testimony of Victoria Price, one of the women

involved in the Scottsboro Case. Price claim “that her head was cut open by a blow from the butt of a pistol,” but the doctor who examined her found only “superficial bruises and scratches” (10). The article questioned Price's motives by revealing that she had been arrested for “offenses against the moral code” and that she was trying to avoid her own arrest for vagrancy and other promiscuous activities (Daniell 10). The trial was not resolved until 1976 after several mistrials and appeals (Johnson 5). The case resulted in a judicial-system change allowing equal numbers of African Americans on juries. The long ordeal may not have ended well for some of the African American involved, but the case revolutionized the business of the courts by removing racial barriers.

Conclusions

Although there are plenty of cases across the United States that involve poor raped victims, Lee's *To Kill a Mockingbird* had a specific message that impacted society. Through the novel, Lee fought for the innocence of Robinson and made the reader hope for his freedom. Having the story told by a young narrator like Scout created a new dynamic in the story. The naivety of the narrator lent a childlike innocence as well as an unbiased perspective towards Robinson. Scout saw Robinson as a regular, “working man” with a wife and kids an average American family. Witnessing his life being torn apart by prejudice allowed the narrator's thinking to mature. The reader then may look at the situation and circumstances through a child's eyes and see the person rather than the color of skin.

The 1930s through the 1960s was an era when not only were African Americans were discriminated against not only in schools and businesses but also in the court, an institution that was supposed to uphold equality. The struggles in *To Kill a Mockingbird* and the Scottsboro trial were not only a battle to defend the rights of African Americans, but between the innocent and “the secret court of men's hearts” (Lee 241). The agenda of “white” men exceeded the justice of the court. Though Tom Robinson was fictitious, he might be proud to see the impact he made on people's lives, especially Scout's. Likewise the Scottsboro Boys made and changed history by sacrificing their lives to that of the cold hearts of the jury, showing that reality is something sometimes as strange as fiction.

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The Psychosocial Effects of Feminine Beauty in *A Streetcar Named Desire*

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Abstract — American culture after WWI reinvented itself by breaking away from the traditions of Europe, experimenting with alternative forms and techniques within art and literature, and reconsidering the gender archetypes of the past. Providing invaluable insight into the culture of this time period, modernist literary works, journals, and periodicals reveal the importance of cleanliness, both physically and morally, as a characteristic virtue for women of the early twentieth century. As exemplified in Tennessee Williams's *A Streetcar Named Desire*, Blanche DuBois demonstrates through her dialogue and obsessive bathing how a woman's perceived cleanliness can effectively compensate for other esteemed qualities such as youth, beauty, and vitality, ones she may be lacking in due to age, poor lifestyle choices, or substance abuse, respectively. Additionally, modernist texts and media can be looked upon as the origins of America's longstanding obsession with cleanliness or the perception thereof by both sexes as a social responsibility and mark of civility.

Keywords — Gender, Femininity, Cleanliness, Beauty, Modernism

Introduction

For centuries, civilizations around the globe have prioritized physical attractiveness and moral character as critical aspects of feminine beauty. During the modernist period of the early twentieth century, advertisements published in periodicals clearly demonstrate that society valued women with youth and cleanliness in both body and spirit, especially for those considering the prospect of marriage. As a consequence, many modernist works focus on the extent to which female characters embody these qualities or at least attempt to do so. Even as the modernist media advertised products in helping women attain or to at least give the appearance of having these desirable qualities, selections of modernist literature demonstrate the extent to which women during this period would sacrifice themselves and their identity in acquiring habitual cleanliness, health, and youth. In the case of *A Streetcar Named Desire*, Blanche DuBois is unable to possess these indispensable characteristics in full due to her promiscuous past and cynical perspective on age, yet she nevertheless attempts to

create a fantasy within the minds of others, and in her own to a certain degree, suggesting she remains the chaste, naïve, and youthful girl she once was, a state in which society would gladly accept her as an eligible bachelorette.

Section Two

The Magic of Bathing

Modernist periodicals often include advertisements for soaps and other cleaning products with zealous claims. For example, *The American Magazine* in one of its 1910 issues contained an advertisement for a bathing regimen that effectively “removes superfluous fat and gives a slender, firm stylish figure. Merely use a little twice a week in warm water when taking a bath. No need of taking drugs or starving yourself” (Landshut, 1910, p. 110). In building its credibility, it mentions additionally how the saline solution has been “patronized by royalty [and has become] famous for centuries. Endorsed by the Medical Profession. Praised by those who have used it” (p. 110). Regardless of whether one should be persuaded by its claims, the advertisement nevertheless reveals to the reader the extent to which bathing had become an important ritual in modernist society, particularly among women, with the aim of purging oneself of impurities.

Cleanliness as a Source of Confidence and Power

In *A Streetcar Named Desire*, bathing and the use of perfume are Blanche's central activities throughout much of the play, resulting in a borderline obsession. Just as she arrives at the home of the Kowalskis upon meeting her sister Stella in Scene One, Blanche insists, “now, then, let me look at you. But don't you look at me, Stella, no, no, no, not till later, not till I've bathed and rested” (Williams, 2004, p. 11). During the beginning of the play, the viewer is introduced to the entirety of Blanche's predicament as she begins living with Stella and Stanley, namely adapting to working class conditions in a different culture and geographic location, satiating her alcoholism, and escaping her notoriety from living at a hotel known for its special accommodations. She is ashamed of herself. She wishes to take an initial bath after

having met her sister to figuratively wash and rid herself of her past so that she may have a new start.

In Scene Two, as she leaves the bathroom and seeks to attract Stanley's undivided attention, she shouts to him, "hello, Stanley! Here I am, all freshly bathed and scented, and feeling like a brand new human being" (p. 36). Blanche finds an inexplicable sense of comfort in the bathing ritual and additionally in the scent she wears. Perfume historically has served a dual purpose, offering its wearer and those around a pleasant aroma and, in a more pragmatic sense, masking odors. Just as the baths physically and, in Blanche's mind, symbolically cleanse her of the past, her love for perfume is representative of her desire to conceal her true identity, alcohol use, and outlook on life under the pretense of Southern gentility and the values she had adopted as a young girl.

Her perfume later in Scene Two demonstrates itself to have a power of its own, having an ability to influence even the behavior and temperament of Stanley, the embodiment of unyielding, ruthless authoritarianism. As Stanley begins elaborating upon the tenets of the Napoleonic code as they apply to the roles of men and women in Louisiana, the stage direction explains Blanche "spritzes herself with her atomizer; then playfully sprays him with it. He seizes the atomizer and slams it down on the dresser. She throws back her head and laughs"(p. 41). She effectively uses the laugh to disassociate and sublimate herself from the working class conditions of her current residence. While Stanley, with his hyper masculine temperament, decidedly rejects the perfume because of its feminine scent, he finds wearing it would additionally compromise the genuine and forthright nature of his character.

Cleanliness as an Alternative to Youth

Concerning the cosmetics industry during the modernist period in the United States, one of more popular products advertised and sold due to popular demand by women of all ethnicities was skin cream aimed at leaving its user with a youthful appearance. *The Crisis*, as a publication with African-American culture as its foundation, often included advertisements for these products such as those made by Kashmir Productions. The company claims that its "preparations produce new skin as well as whiten, soften and cleanse the skin. Wrinkles, blackheads, and liver spots disappear immediately. The complexion takes on the charm and color of youth" (Kashmir Productions, 1916, p. 44). While Kashmir Preparations mentions that their products produce a whitening effect, its emphasis is primarily on how the user may conceal her signs of aging while simultaneously developing

a more radiant, youthful glow to the skin. In comparison, a later issue of *The Crisis* includes an advertisement by Yvonne Laboratories stressing the benefits women will experience from the habitual use of their exclusive and easy-to-use "Lemon Massage Cream [that] will work wonders with your skin. A wonderful bleaching cream for sunburns. Keeps the skin smooth, firm and youthful looking. Clears up muddy and sallow skins. Removes lines and wrinkles. Guaranteed harmless" (1921, p. 142).

In the context of ads like this, women of the modernist period were hyperaware of the value society placed on youth and its preservation as one makes the transition into middle age. While Blanche makes it a priority to practice good hygiene and at minimum maintain the appearance of health, no other concern dominates her being and essence more than her obsession with youth. Just as *The Picture of Dorian Gray* recounts a man's selling of his soul for the gift of forever being young, Blanche, because her youth is evanescent, will do anything in her power to give the illusion of possessing it in abundance through crafty, convoluted ways of manipulating light and darkness, as well as cosmetic products. For example, as Mitch begins spending time with Blanche throughout the course of the play, he begins recognizing she only spends time with him during the night and in scenarios where "it's always some place that's not lighted much" (Williams, 2004, p. 144). Blanche favors the darkness as a crutch to conceal her age, but given her approach to the use of bathing, perfume, and makeup, her affinity for darkness mirrors her life of secrecy.

While Blanche remains preoccupied with her negative attitude towards aging, Mitch, on the contrary, explains, "I don't mind you being older than what I thought. But all the rest of it—Christ! ...Oh, I knew you weren't sixteen any more. But I was a fool enough to believe you was straight" (p. 145). In this moment, Blanche realizes that youth, in Mitch's eyes, is less of a priority in his desire to begin a serious relationship with her than is her integrity that she seems to boast of so confidently. Because of his newly acquired knowledge of her past at the Tarantula Arms, he finds Blanche "not clean enough to bring in the house with my mother" (p. 150). Even if Blanche were to regain her youth, her lack of morals with regard to chastity and subsequent succession of boldfaced lies on the topic would belie her outward cleanliness and discourage any man who would otherwise pursue her for marriage.

Blanche as the Modern Woman

Though Blanche DuBois in *A Streetcar Named Desire* is delirious and devotes her life and the choices she makes to a self-constructed fantasy, her character is consistent with and adherent to the tenets of modernism. Many works during this time period would focus on a “loss of the real” (Dolfsma, 2004, p. 352), the way “the world outside is contrasted with the representation that the individual has of it in his own mind” (p. 353). During her most honest moment in the play, Blanche confesses, “I don’t want realism. I want magic! ...Yes, yes, magic! I try to give that to people. I misrepresent things to them. I don’t tell truth, I tell what *ought* to be truth. And if that is sinful, then let me be damned for it” (Williams, 2004, p. 145). Blanche proves to be maladjusted for the modern world. Stella is able to see a future outside of the wealthy world of Belle Rêve and as a consequence is able to live a meaningful life with an intrepid, yet dedicated husband. Blanche, because of her inability to recognize the decline of her family’s prominence in Mississippi and the finality of her husband’s death, finds it continually challenging to adapt to the rapidly changing world she finds herself in.

Conclusions

Blanche fully understands modern society’s highest regard for youth, cleanliness, and health in women of marrying age, but what she fails to realize is that the retaining or procuring of these qualities cannot compensate for her damaged sense of honor and adherence to morality. The soap she uses and the perfume she wears cleanse and mask her body, yet neither can wash away nor conceal her past with other men as she continues to insist on her purity to Mitch. While Mitch initially was attracted to Blanche and clarified his disregard for her age, her pathological lying made him view her as entirely immoral and unfit for becoming a proper wife. The modernists respected and prized truly clean, youthful, and healthy women not only as an ideal of feminine beauty but also as evidence for a woman with an inherent value system.

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Estimating Species Richness and Relative Abundance of Ticks in the Upstate of South Carolina for the Purpose of Assessing the Risk of Human Tick-borne Disease

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Abstract – The purpose of this study was to estimate species richness and relative abundances for tick species in the upstate region of South Carolina in order to assess the potential risk of tick-borne diseases to humans participating in outdoor activities. A variety of methods including a sweep-and-drag technique, dry ice traps, and solicitations from natural resource personnel were used across a range of habitats including hardwood and pine forests, old fields, and edges. A total of 67 ticks representing two species (American dog tick and lone star tick) were collected with the relative abundance of the former species equal to 0.955. For reasons that are not readily apparent, the sweep-and-drag method, a standard technique, yielded a total of only one specimen despite more than 36 person-hours of sampling. Since American dog ticks were the dominant species collected, diseases for which it is a vector (Rocky Mountain spotted fever, ehrlichiosis, and tularemia) pose the greatest probable threat to human health in this geographic area. With medical literature indicating an increased likelihood of shifting geographic ranges of ticks and their host species due to global climate change, studies similar to this one will play a valuable role in assessing risk from these diseases.

Keywords – Ticks, Species Richness, Relative Abundance, Rocky Mountain spotted fever

Introduction

Tick-borne diseases are growing in number throughout the United States, likely as a result of global climate change affecting the range and distribution of various tick species. With tick borne diseases' geographic range expanding, there is a greater need for research concerning the distribution of ticks that carry various diseases. In order to better prevent tick-borne diseases, research needs to be performed to establish species richness and relative abundances of ticks in affected areas. A growing number of tick-borne diseases are believed to be a possible threat in South Carolina, some of which include Lyme disease, Rocky Mountain spotted fever and ehrlichiosis.

Lyme disease has become the most prevalent vector borne disease in the United States, continuing to increase in number with more than 100,000 reported cases by the Center for Disease

Control and Prevention (Brownstein, Holford & Fish 2003). It is the most common of all tick-borne diseases, which includes Rocky Mountain spotted fever, and is usually characterized by headaches, fever and fatigue as well as the notorious bullseye rash known as erythema migrans (Brownstein, Holford & Fish 2003). Antibiotics are the primary treatment for Lyme disease and the prognosis is usually confident when treated early. However in many circumstances it is left untreated due to its common symptoms with the flu. If left untreated, symptoms can result in joint pain, arthritis and heart and nervous system complications (Gatewood 2008).

Vector borne diseases such as Lyme disease rely on certain factors such as climate, landscape and vertebrate reservoirs for them to flourish. Early case reporting showed cases of Lyme disease in all states but also high incidence of the disease in the Northeast United States and parts of the Midwest (Brownstein, Holford & Fish 2003). Due to the fact that Lyme disease had been controlled by antibiotics and did not present life threatening injuries, research surrounding the disease began to subside. In more recent years, Brownstein, Halford & Fish (2003) analyzed different factors that affect Lyme disease, deer tick and *B. burgdorferi* distribution such as climate, landscape and abundance of vertebrates that serve as hosts to the bacterium. They created a distribution map illustrating regions that have suitable living conditions for deer ticks and *B. burgdorferi*. Surprisingly, much of the Southeastern United States has suitable conditions for these organisms but Lyme disease has not shown to be prevalent in this region. This study aims to examine the prevalence of these organisms in the upstate of South Carolina and attempt to understand the differences in the distribution and range of various tick borne diseases.

Borrelia burgdorferi is the bacterial agent and cause of Lyme disease. It is a type of spirochetal bacterium survives in nature through a tick-vertebrate transmission cycle that involves ticks as vectors infecting vertebrates including mammals and birds. In the eastern U.S. deer ticks are the

vector responsible for the transmission of Lyme disease (Gatewood 2008).

Ixodes scapularis is the primary vector for the transmission of Lyme disease, infecting a multitude of small and medium-sized mammals. *Borrelia burgdorferi* is transferred to a vertebrate from the bite of a deer tick. Transmission of *B. burgdorferi* to humans is accidental and results in termination of the life cycle of the bacterium (Gatewood 2008). 98% of all *B. burgdorferi* transmissions are caused by the nymphal form of deer ticks. Deer ticks have a wide range of available hosts, including mammals and birds, but their primary host is the white-tailed deer, *Odocoileus virginianus*. Deer ticks reside in many forest landscapes and can be found across the Eastern United States and parts of the Midwest. They are found in the soil and leaf debris of temperate deciduous forests, which provide sufficient shade, moisture and reservoirs of hosts (Gatewood 2008). Recent studies are demonstrating that the range of deer ticks in the U.S. is beginning to expand (Brownstein, Holford & Fish 2003). This study will be able to identify the presence of various ticks in upstate South Carolina, further mapping out the distribution and range of the various species.

Rocky Mountain spotted fever is another common tick-borne disease that is prevalent in throughout much of the Southeastern United States with North Carolina having the highest incidence (Jamie 2002). Rocky Mountain spotted fever is caused by a bacterium, *Rickettsia rickettsii*, which lives in the gut of American Dog ticks (*Dermacentor variabilis*). *Rickettsia rickettsii* is transmitted to humans via a bite from an American dog tick.

Symptoms of Rocky Mountain spotted fever include fever, nausea, vomiting and muscle pain as well as the development of a maculopapular rash (Jamie 2002). Much like Lyme disease, the symptoms of Rocky Mountain spotted fever are quite similar to the flu which can cause a misleading diagnosis. Similar to Lyme disease, when left untreated, Rocky Mountain spotted fever can lead to central nervous system, hepatic and pulmonary injury and often can be fatal. The primary treatment for Rocky Mountain spotted fever is doxycycline, a tetracycline antibiotic (Jamie 2002). The use of other antibiotics besides doxycycline is associated with a higher risk of fatal outcome.

The American Dog tick has three stages in its life cycle: larva, nymph and adult (Jamie 2002). The adult form is the only form which feeds on humans and transmission of the disease usually requires 6 to 10 hours of host feeding. Incidence of Rocky Mountain spotted fever tends to increase

during the summer months from April through October, causing the southern United States to have a longer period of susceptibility (Jamie 2002). American dog ticks were originally discovered in the western United States around the Rocky Mountains. As research concerning tick-borne diseases began to rise, it was discovered that their geographic range actually expanded across most of the central and eastern United States (Jamie 2002).

During its discovery in the 19th century, Rocky Mountain spotted fever was found to be prevalent near the Rocky Mountains. Upon more research, it was discovered that Rocky Mountain spotted fever was much more prevalent than first anticipated, being prevalent throughout much of the eastern United States. Since the early 1960's, the incidence of Rocky Mountain spotted fever has risen gradually. With recent knowledge concerning climate change, it is hypothesized that the geographic range of Rocky Mountain spotted fever is expanding (Randolph 2010).

This study aims to investigate the relative abundance of various tick species and in the upstate of South Carolina. This study will provide baseline data on habitat preferences, range, and distribution that may be used to track the spread of tick-borne diseases in the face of global climate change. Moreover, this study may provide useful reference data for future studies investigating the presence of tick-borne diseases in South Carolina, thus offering valuable information that can be used for increased prevention and risk assessment.

Materials and Methods

Sweep and Drag Technique

A 1-m² piece of white felt was attached to a wooden pole. The participant would walk along a path brushing the felt piece along any vegetation or tall grass as well as leaf litter and debris, which is the known habitat for many tick species. This is a standard technique that is widely regarded as the most fruitful in terms of obtaining ticks. Another form of this technique included attaching a string to the 1-m² piece of felt and dragging it behind while walking through vegetation. This technique, oddly enough, only produced a minimal amount of our total obtained.

Dry Ice Traps

The dry ice traps used consisted of a large Styrofoam bucket filled with dry ice. This was then placed on a large piece of plywood located in tick habitat. The plywood surrounding the bucket was then coated with an adhesive which would trap ticks as they attempted to walk across the board.

This is a less commonly used practice and proved to be ineffective in this study.

Solicitations from Hunters, Fishermen and Natural Resource Personnel

We contacted various outdoorsmen in our area and asked that they would give any ticks they found to us for our research. This method proved to be the most effective and accounted for the majority of our ticks that were obtained.

Results

Table 1. Number of Ticks and Species found using each technique.

	Deer ticks obtained	American dog ticks obtained	Lone star ticks obtained
Sweep and Drag	0	1	0
Dry ice traps	0	0	0
Solicitations from Outdoorsmen	0	63	3

Table 2. Relative Abundances of Ticks

	Deer ticks	American dog ticks	Lone star ticks
Relative Abundance	0	0.94	0.06

Conclusions

For reasons that are not readily apparent, the sweep-and-drag method, a standard and usually-productive technique, yielded a total of only one specimen (American dog ticks) despite more than 36 person-hours of sampling across a diversity of community types. Although it is impossible to know the underlying reasons for this sampling anomaly, an unusually wet field season may have contributed, consequently confounding the results.

Since American dog ticks were the dominant species collected, one can infer that diseases for which it is a vector (Rocky Mountain spotted fever, ehrlichiosis, and tularemia) pose the greatest probable threat to human health in this geographic area. However, due to the aforementioned idiosyncratic sampling results, the potential for other tick-borne diseases (Lyme disease, Southern tick-associated rash illness-STARI, anaplasmosis, and babesiosis) should not be ignored. With medical literature indicating an increase in existing and emerging tick-borne illnesses and the likelihood of shifting geographic ranges of ticks and their host species due to global climate change, baseline studies similar to this one will continue to

play a valuable role in assessing risk from these diseases.

Acknowledgements

Thank you to the South Carolina Independent Colleges and Universities for their funding of this research. I would also like to thank Southern Wesleyan University for allowing the use of their labs and materials for this project. I would also like to give a special thank you to Dr. Rocky Nation for his countless aid through this entire process. His help was instrumental to this research and it would not have been accomplished without him.

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Small Mammal Community Structure within Urban Greenways

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Abstract — Urbanization leads to the removal of natural habitats and is a major contributor to the loss of biodiversity. The retention of greenways is one method to mitigate the loss of wildlife habitat within urban and suburban areas. Urban greenways are linear parklands maintained in a more natural condition than typical urban parks. Although several studies have addressed the use of urban greenways by birds, little is known regarding their impact on mammal populations. We sought to determine if urban greenways in Spartanburg, South Carolina have a small mammal community similar to that of forests in rural Spartanburg County. In addition, we wanted to determine whether vegetation density influences the abundance of white-footed mice (*Peromyscus leucopus*). During May and August of 2013, we live-captured small mammals at 4 urban greenways and 2 rural forests. We then used a profile board to visually estimate the density of vegetative cover at 20 randomly selected locations within each study site. The white-footed mouse was the most abundant small mammal at 5 of the 6 sites, comprising 50 – 100 % of all individuals captured at urban greenways and 59 – 83 % of all individuals at rural forests. The golden mouse (*Ochrotomys nuttali*) was the second most abundant small mammal. Vegetation density was significantly higher within urban greenways than at rural forests. Across all study sites, we found a positive trend between vegetation density and the abundance of white-footed mice. Our results suggest that urban greenways provide suitable habitat for native small mammals in South Carolina.

Keywords - greenway, urban, capture-mark-recapture, *Ochrotomys*, *Peromyscus*

Introduction

Widespread urban development has resulted in the fragmentation, modification, and destruction of wildlife habitat. Due to urban sprawl, much of the wildlife habitat around the world exists in patches interspersed within a human-dominated landscape (Cam *et al.*, 2000). For example, the amount of developed land in the Upstate of South Carolina is increasing drastically, from 90,142 ha in 1990 to 233,234 ha in 2000. By 2030, the amount of developed land in Upstate South Carolina is expected to reach 616,606 ha (Campbell *et al.*, 2008). As a result of urban sprawl in South Carolina and elsewhere, some biologists have promoted “reconciliation ecology” as a means by

which urban lands can be managed to protect native wildlife (Rosenweig, 2001). One strategy of reconciliation ecology is to preserve greenways within the urban matrix. Urban greenways are often linear stretches of land kept in a more natural state than an urban park (Schiller and Horn, 1997).

Although it is presumed that urban greenways provide suitable habitat for small mammals, there have been few tests of this assumption. In some urban areas, native species may be outcompeted by introduced species, reducing the conservation value of the protected land (Shochat *et al.*, 2012). In this study we sought to determine i) whether urban greenways in Spartanburg, South Carolina have a small mammal community similar to the rural forests and ii) if the abundance of white-footed mice (*Peromyscus leucopus*) is influenced by vegetative density.

Materials and Methods

We capture-mark-recaptured small mammals at six study sites consisting mostly of oak-hickory riparian forest. Four of the live-trapping locations were within urban greenways (Upper Chinquapin Greenway, Milliken, Sherman, and Upstate) in the city of Spartanburg, while the remaining two were rural sites at the Pacolet River Heritage Preserve. At each site, we set out a 5 x 25 grid of H. B. Sherman live traps evenly spaced at 10 m apart. Trapping was conducted at each site for 7 continuous days during May and August. Traps were baited with oatmeal, black oil sunflower seeds, and bacon bits and then checked each morning before 0900. For each individual captured, we recorded their mass, tail length, hind foot length, gender, reproductive condition (male: scrotal or non-scrotal; female: lactating, pregnant, or non-reproductive), and age class (adult or juvenile). Individuals were marked with a uniquely numbered Monel-1 ear tag (National Band and Tag Company, Newport, KY).

We estimated the abundance of white-footed mice at each site using a Schnabel index and then calculated the effective trapping grid size using the method of the mean maximum distance moved (MMDM; Wilson and Anderson, 1985). The density of white-footed mice at each site was calculated as

the Schnabel abundance/effective trapping grid area.

Horizontal vegetative cover was estimated for the Sherman and Milliken sites during July, 2013. All other sites were surveyed in July, 2011. At 20 randomly selected locations at each site, we used a 2m profile board to determine the proportion of the profile board that was visible at a distance of 15m from the observer. Vegetation density was visually estimated every 0.5 m on the board such that: 1 = 0-19% of the board was visually obstructed, 2 = 20-39% visual obstruction, 3 = 40-59% visual obstruction, 4 = 60-79% visual obstruction, and 5 = 80-100%. We calculated the mean vegetation cover for 0-1 m above the forest floor. A non-parametric Spearman correlation was used in VassarStats to determine the relationship between mean horizontal cover at each site and the density of white-footed mice during May and August, 2013.

Results and Discussion

The species composition of the small mammal community at urban greenways was similar to that of rural forests, largely due to the prevalence of white-footed mice across all sites (Table 1). White-footed mice comprised 50 – 100 % of all individuals captured at urban greenways and 59 – 83 % of all individuals at rural forests. In addition, we did not encounter any introduced species such as the European house mouse (*Mus musculus*). Our results parallel those of Kapfer and Munoz (2012), who found that white-footed mice can thrive within urban woodlands. The Shannon diversity for the small mammal community at each site was low, but similar to that found in other studies the region (Constantine et al., 2004; Kapfer and Munoz, 2012).

The density of white-footed mice was higher at urban greenways than at rural forests during both trapping sessions (Fig. 1). In addition, we found a positive relationship between mean forest floor vegetation density and the density of white-footed mice ($r = 0.687$, $df = 10$, $p = 0.016$, Fig. 2). This matches Anderson et al. (2003), who found that dense forest understories offer protection from predation and result in a high abundance of white-footed mice. Narrow forest patches such as urban greenways likely have high light penetration to the ground-level, resulting in dense vegetative growth.

Conclusions

Urban greenways in Spartanburg, South Carolina tend to have greater horizontal vegetation cover than the rural forests. Since white-footed

mice prefer dense, brushy habitat, it is not surprising that there was a higher density of mice at urban greenways when compared with rural forests. The high density of white-footed mice, and the lack of invasive species, suggests that urban greenways provide suitable habitat for small mammal communities.

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Tables & Figures

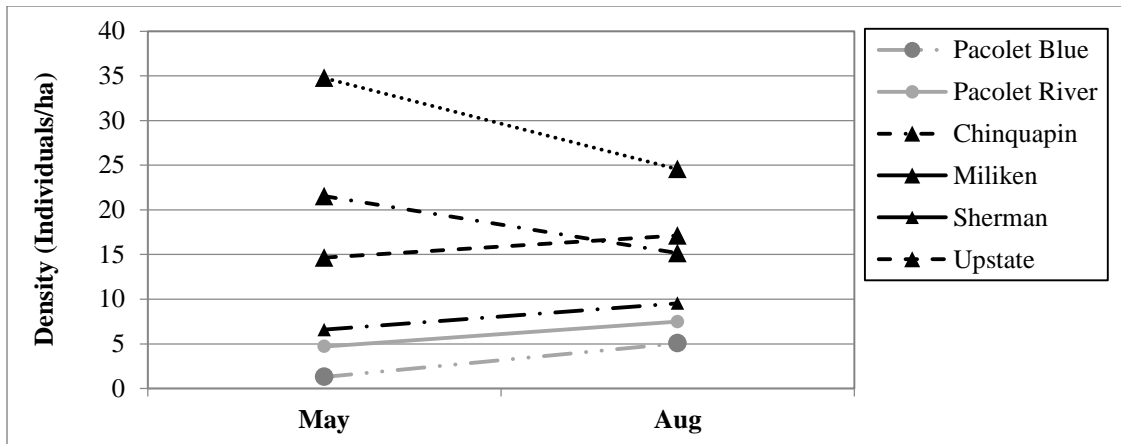


Figure 1. Density of white-footed mice (*Peromyscus leucopus*) at 2 rural forests (Pacolet North and Pacolet South) and 4 urban greenways (Chinquapin, Milliken, Sherman, and Upstate) during May and August, 2013.

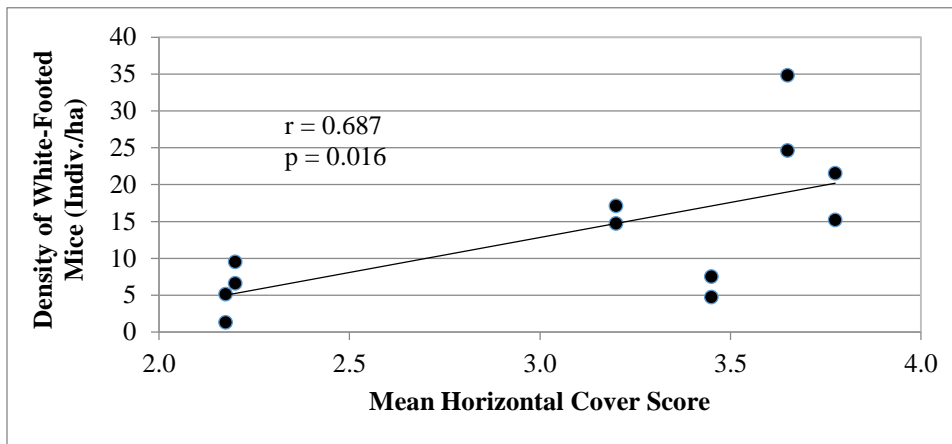


Figure 2. Relationship between mean horizontal cover score and the density of white-footed mice (*Peromyscus leucopus*) at each study site during May and August, 2013.

Table 1. Number of individuals captured at 4 urban greenways and 2 rural forests in Spartanburg County, SC during May and August, 2013. (Numbers indicate mammals captured: 1 = Southern Shrew, 2 = Chipmunk, 3 = White-Footed Mouse, 4 = Golden Mouse, 5 = Pine Vole)

	Site	Month	Species					Shannon Index
			1	2	3	4	5	
Urban Greenways	Chinquapin	May	0	3	33	0	0	0.30
		August	0	0	26	0	0	1.00
	Milliken	May	1	5	57	0	2	0.70
		August	6	20	44	0	2	0.96
	Sherman	May	0	0	10	8	0	6.87
		August	0	3	21	11	0	0.88
	Upstate	May	0	0	24	0	0	1.00
		August	0	0	37	0	0	1.00
Rural Forests	Pacolet South	May	1	0	4	1	0	0.87
		August	0	0	11	2	0	0.43
	Pacolet North	May	0	0	11	24	0	0.62
		August	0	0	14	14	1	0.82

Determining the Cuticular Hydrocarbons Involved in Chemosensory Systems of the Parasitoid Wasp, *Dasymutilla occidentalis*

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Abstract — *Dasymutilla occidentalis* lays its eggs in brood chambers in bumblebee hives. The *D. occidentalis* larvae feed on the larvae of the bumblebees, thus establishing its parasitoid relationship with bumblebees. It is theorized that *D. occidentalis* use chemosensation of the cuticular hydrocarbons from the bumblebees found in the soil to discover the location of the hives. During excavation of their nest, the bumblebees inadvertently impregnate the soil with the hydrocarbons from the hairs and outer layer of the cuticle. Female *D. occidentalis* may use these chemosensory cues to localize nest openings. The purpose of this experiment is to determine the cuticle hydrocarbon involved in the search behavior of female *D. occidentalis*. Determining the composition of the bumblebee cuticle began with extracting the hydrocarbons with hexane. This hydrocarbon-hexane solution was injected into a gas chromatograph/mass spectrometer, and the subsequent chromatograph was compared to a chromatograph of known substances. It was determined that the cuticular hydrocarbons of the bumblebee are composed primarily of long unsaturated hydrocarbons with few alkene derivatives. In comparison to a honeybee chromatograph, two hydrocarbons were determined to be candidates for chemosensory search behaviors. These hydrocarbons are tentatively identified as tricosenes and pentacosenes.

Keywords — Chemosensation, *Dasymutilla occidentalis*.

Introduction

Dasymutilla occidentalis, also commonly known as the velvet ant, cow killer, and cow ant, is a parasitoid wasp known to lay its eggs in the brood chambers in bumblebee hives. Winged, male *D. occidentalis* carries the wingless female aloft during mating. After the mating process the female *D. occidentalis* roams the surface in search of a suitable host for her eggs, typically a bumblebee hive. Once a hive has been located the female will burrow into the soil in search of an entrance, invade the hive, and finally oviposit the eggs in the brood chambers of the bumblebee larvae. After *D. occidentalis* larvae hatch, they feed on the larvae of these hosts, thus establishing its parasitoid nature (Brothers 2000).

During excavation of their nest, the bumblebees likely impregnate the soil with the

hydrocarbons from the hairs and outer layer of the cuticle. It is theorized that *D. occidentalis* use chemo-sensation of these cuticular hydrocarbons in the soil to discover the identity and the location of the hives.

Behavioral Assay

Initial research on *Dasymutilla occidentalis* began with a behavioral assay, which consisted of a choice experiment of four dried substrates: crushed cuticle from bumblebees (BB), honeybees (HB), crickets (C1), or coconut husks (CO). A schematic of the behavioral assay design is shown in Figure 1.

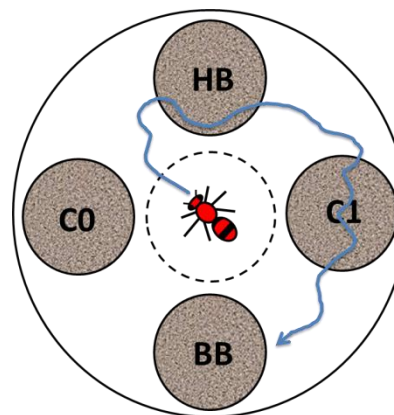


Figure 1. Each female *D. occidentalis* was allowed to roam for six minutes in the arena. The total time the head was above each substrate was recorded to calculate percent occupancy time.

The dwell-time of the wasp over each substrate was recorded. Over a six minute period *D. occidentalis* spent significantly more time interacting with the substrate composed of crushed bumblebees than any other substrate (ANOVA, $n = 15$, $\alpha = 0.05$, $p < 0.0001$). *D. occidentalis*' preference to dried, crushed cuticle from a bumblebee compared to honeybees, a non-host hymenopteran, suggests a compound present in the bumblebee hydrocarbon that is absent in cuticular hydrocarbons of honeybees (Moller 2013).

Extraction Methods

In order to determine the specific compounds involved in chemo-sensation, the entire composition of the bumblebee cuticle was investigated. First, hydrocarbons from bumblebee cuticle were extracted with hexane. This hydrocarbon-hexane solution was separated into its individual components by gas chromatography/mass spectrometry (GC/MS). The GC temperature profile was set to increase from 70 °C to 270 °C over a 40 minute time period. A 1 µL injection of the hexane extract was made with the GC operating in a splitless mode. The sample is separated as it travelled through a 30m capillary column using a helium carrier gas.

Compound Identification

The chromatographic separation of the cuticular hydrocarbons of the bumblebee is shown in the gas chromatogram in Figure 2.

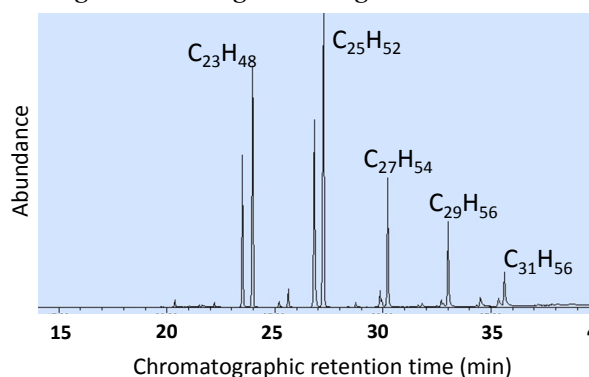


Figure 2. Gas Chromatogram of the cuticular hydrocarbons of the bumble bee. The chromatogram reveals seven primary hydrocarbon species. These species are identified as straight chain unsaturated hydrocarbons.

Comparison of the chromatogram retention times to the retention times of known hydrocarbons allowed for compound identification of seven of the most prominent compounds in the chromatogram. From this analysis it was determined that the cuticular hydrocarbons of the bumblebee are composed primarily of long unsaturated hydrocarbons with a few alkene derivatives ranging approximately from C-23 to C-31. Interestingly, the odd number hydrocarbons are present in vastly greater numbers than the even numbered straight chain hydrocarbons.

A comparison of the cuticular hydrocarbons found in the bumblebee to the hydrocarbons produced by honeybees was made to determine the compounds unique to the bumblebee. Figure 3 shows a portion of the chromatogram comparing bumblebees (black trace) to honeybees (red trace).

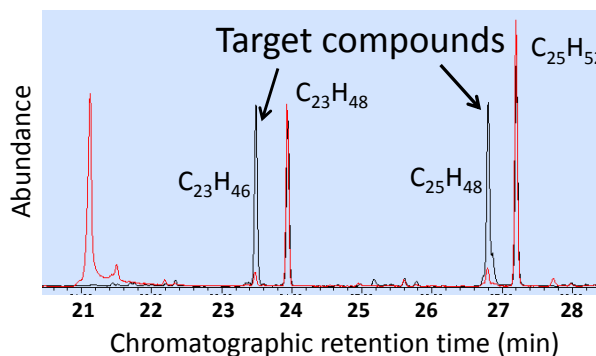


Figure 3. Chromatographic comparison of hydrocarbons produced by bumblebees (black trace) to hydrocarbons produced by honeybees (red trace). The compounds initially identified as tricosene ($C_{23}H_{46}$) and pentacosene ($C_{25}H_{48}$) are found in bumblebees in substantially greater concentrations than honeybees. These two compounds will be the target hydrocarbons for future biological assays.

The comparison of the two chromatograms shows two compounds unique to the bumblebee cuticular hydrocarbons. The two compounds, labeled Target Compounds in Figure 3, were analyzed by their mass spectral fragmentation patterns. While not conclusive as an identification tool, the mass spectral fragmentation patterns are consistent with the target compounds corresponding to straight chain hydrocarbons with a single double bond. The target compounds considered to be chemosensory candidates are tentatively identified as tricosene ($C_{23}H_{46}$) and pentacosene ($C_{25}H_{48}$).

The next step in this work is to isolate the target compounds and utilize them in behavioral assays to test the chemosensory efficacy by *D. occidentalis*. In order to isolate these hydrocarbons, flash chromatography is used to separate the cuticular hydrocarbons extracted from bumblebees. Once isolated, individual compounds will be used in the choice experiments above. Currently, separation experiments of these similar compounds is proving to be challenging.

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Petals abscise earlier under hot, dry conditions for *Linum rigidum*, a dry prairie species

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Abstract – *Linum rigidum* (stiff flax) is a small plant that grows in moisture-limited habitats, but it has large petals that may substantially increase water loss. Perhaps, as a consequence, the corolla typically abscises in the afternoon of the day of opening. Three studies were conducted in order to examine the effect of weather conditions on time of petal abscission. First, we used a fan in a screen-house with little natural breeze to test the effect of wind speed (0, 3, or 6 m/s) on the time of petal abscission. The study did not show a significant influence of wind speed but did suggest an effect of humidity. Next, we found that in a humidity-controlled growth chamber, petals abscised earlier at low humidity (40%) than high humidity (80%). The third study investigated the relationship between petal abscission and natural variation in weather conditions including our wind study and two earlier studies in 2012 and 2013. Time of petal abscission was compared to several weather-related variables including temperature, relative humidity, and wind speed. We found that petals abscised earlier on hotter days, and there was some trend for petals to abscise earlier on dry days with high evaporative potential. Our data indicate that *Linum rigidum* petals abscise earlier under dry hot conditions, which suggests that early petal abscission functions to reduce water loss.

Keywords – Flowering phenology, petal abscission, transpiration, weather conditions

Introduction

A plant with large petaled flowers may experience water loss through petals, potentially leading to drought stress. Some plants might lose their petals; their petals might wilt; or they might close their petals to minimize this problem. *Linum rigidum* has large petals, compared to the size of the plant, and inhabits a dry environment. In their natural environment *L. rigidum* loses petals around mid-afternoon, a few hours after opening. Consequently, we were interested in whether climatic factors related to water loss explained variation in time of petal abscission.

Studies of petal closing or abscission to prevent water loss are scarce. It is known that petal opening and closing in tulips responds to temperature (Azad *et al.* 2004). However, the flowers open at warmer temperatures indicative of daytime and close at colder temperatures indicative of nighttime. This

pattern suggests that petal opening and closing is not related to prevention of water loss. Some research has been done commercially in cut flowers to investigate the reason for petal loss and petal wilting, and humidity has been shown to be an important factor on the time of petal abscission. For *Camellia japonica* petals were retained longer at higher humidity indicating that petals abscise earlier during hot, dry conditions (Doi and Reid 1995).

The purpose of our experiment was to determine if variation of weather conditions, such as, wind, humidity or temperature, has an effect on time of petal abscission in *Linum rigidum* (stiff flax). We hypothesized that as wind speeds increase, humidity decreases, and temperature increases, the petals fall off earlier.

Methods

Prior to germinating *Linum rigidum* seeds, they were surfaced sterilized with a 0.5 % solution of sodium hypochlorite for 8 minutes then rinsed with distilled water thrice. Afterwards, they were placed in petri dishes to allow germination; subsequently, they were placed on moist filter paper in a petri dish. Following emergence of cotyledons they were planted into 6-pack containers with Metro- Mix 360. The plants were subsequently transplanted into 6.5 * 6.0 cm * 8.8 cm individual pots. The *L. rigidum* were grown under fluorescent lights in a growth room, but for field studies moved outside several days or more before beginning experiments.

For the study of wind control over petal abscission, the plants were kept in a screen-house to simulate a natural environment. On the day prior to the experiment, petals from previously open flowers were removed to ensure that only new flowers were used for the experiment. The following day, the petals open at the top of flower by more than 15 mm were used in our experiment. The plants were randomly assigned into treatments using a random number table but ensuring that some flowers on the plant experienced all three conditions before any treatment was repeated on a second day. Each plant was labeled with a number

and each flower was labeled using paint and thread on the pedicel and the base of the sepal.

The three wind speeds were 0 m/s (control), 3 m/s (low), and 6 m/s (high). A fan was used to create wind and the plants were placed at different distances away from the fan to simulate 3 m/s and 6 m/s. The control group was placed well away from the fan. The plants that were in the high treatment were placed closer to the fan than the low treatment. The screen house allows natural wind; an anemometer was used to measure to winds speeds for the control to account for the natural wind in our experiment. The experiment was set up on Tuesdays and Wednesdays on days without rain between 13 September-13 October (9 days total). The study was initiated at 8:00, prior to full anthesis, and the plants were checked hourly from 12:00 until 20:00. Each hour, the wind speed and temperature for the control were recorded. If the petals were not abscised by 20:00, they were given a value of 22:00. We compared time of abscission among treatments with a non-parametric Kruskal-Wallis test because many flowers did not abscise by 20:00, so time of abscission was not normally distributed. The results were analyzed using MiniTab.

In our second study, we altered humidity in a Precise Humidifier for *Linum rigidum* (40%, 80%). The two programs were set for 40 % and 80 % humidity; the plants were kept at a constant 27 °C and on a 12 hour day/ night cycle starting at 7:30 and ending at 14:30. The experiment was set up on Tuesdays and Wednesdays the evening prior to the experiment. The evening prior to the experiment, the plants expected to open the following day were labeled with paint/ thread and placed in the chamber. The plants were checked the following morning at 09:00 and any flowers that did not open were removed. Petal status (intact or abscised) was checked hourly from 11:00 to 20:00, along with humidity and temperature. If the petals were not abscised by 20:00; they were given a value of 22:00. Time of abscission was compared between treatments with a t-test.

In the third study, we investigated data from previous research with natural variation in weather conditions including our wind study and two previous studies in 2012 and 2013 for which time of petal abscission was recorded. The time of petal abscission was compared to several weather-related variables such as sky condition, visibility, temperature, relative humidity, and wind speed. The weather data was collected from a nearby weather station (Greenville-Spartanburg Airport) was later determined using the National Weather Service's website, (<http://cdo.ncdc.noaa.gov/qclcd/QCLCD?prior=N>). The

time of petal abscission was rounded to the next hour for even measurements. If the petals fell off after 20:00, fell off the next day, or did not fall off, they were given a value of 22:00. The results were analyzed using the statistical regression analysis in Microsoft Excel and R Statistical Software.

Results

Across all three treatments wind speed did not show a significant effect on time of petal abscission ($h = 1.99$, $df = 2$, $N = 105$, $P = 0.271$) (Figure 1) although there was an apparent tendency for increased humidity to delay petal abscission. In contrast, petals abscised significantly earlier at low humidity (40%) than high humidity (80%) in a humidity-controlled growth chamber ($t = 5.27$, $df = 57$, $P < 0.001$) (Figure 2). In the analysis of results with natural weather variation, evaporation potential showed a significant effect on time of petal abscission; petals abscised earlier as evaporation potential increased ($t = -2.709$, $df = 31$, $P = 0.011$) (Figure 3). In the field study, humidity did not show a significant effect on time of petal abscission ($r^2 = 0.05$, $t = 0.164$, $df = 37$, $p = 0.871$). Finally, we found that petals abscised significantly earlier on hotter days ($t = 6.545$, $df = 37$, $p < 0.001$) (Figure 4).

Discussion

As expected, our study indicates that petals abscise earlier on hot, dry days. We found that humidity, temperature, and evaporation potential had a significant effect on time of petal abscission. The wind study showed no significant difference in wind speeds on the time of petal abscission. Our results could have been affected by the time-frame of our study; we ran our experiment between October and November. During this time the temperature was cooler; which could have affected our results because the petals fall off earlier on hot, dry conditions. Wind could be more of a factor when it is hotter or humidity is decreased.

Humidity was found to be a significant factor when the plants were kept in the incubator but not when exposed to natural variation in weather. The reason for this difference could have been that in the field study some plants kept in varying locations and conditions. For example, some of the plants were housed in enclosures or a screen-house and others were open to the environment. In each of these cases the plants may experience different levels of humidity, wind, temperature, and pollination environments; however, in the humidity-controlled growth chamber each plant experienced a controlled and similar environment.

Future research is desired on the effect of humidity to ensure that we can simulate our research in a natural environment. I would like to see if our humidity research could be successfully completed in a greenhouse or in a controlled field setting rather than in an incubator. Also, our wind study should be repeated during a time period where the weather is hot and dry.

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Figures

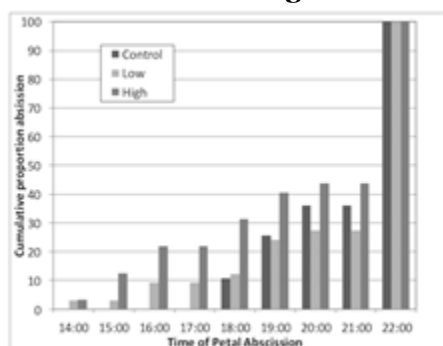


Figure 1: The cumulative proportion of *Linum rigidum* petals abscised at 0 (dark gray), 3 (light gray), and 6 m/s (dark gray) wind speeds. The x-axis represents time of petal abscission and the y-axis represents the cumulative proportion of petals that were abscised.

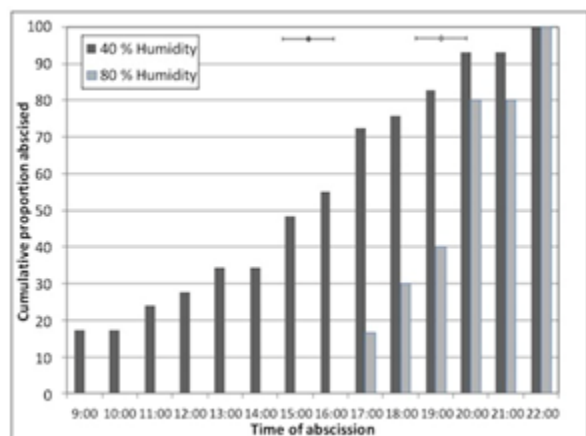


Figure 2: For the experiment using the humidity chamber, the cumulative proportion of *Linum rigidum*

petals abscised at 40 % (gray) and 80 % (black) humidity at different times of day. The average time of petal abscission at 40 % and 80 % humidity is represented above the bar graph (+/- 2 SE).

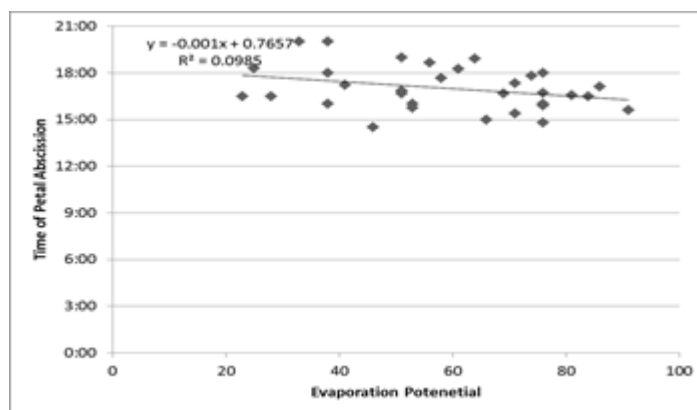


Figure 3: The effect of evaporation potential on time of petal abscission in *Linum rigidum* across multiple field studies. The equation represents the best fit from linear regression.

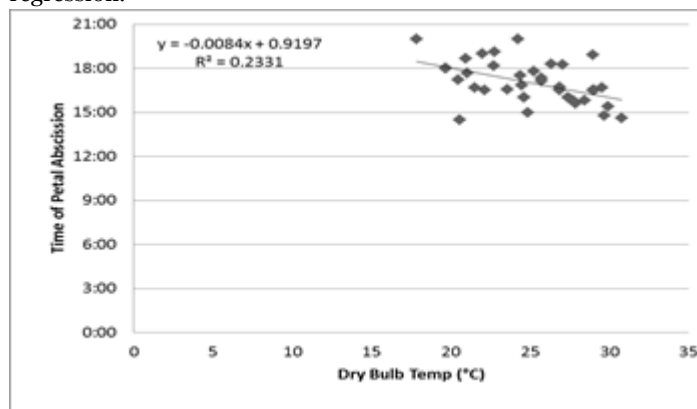


Figure 4: The effect of temperature based on our wind study and two previous studies in 2012 and 2013 on time of petal abscission in *Linum rigidum*. The equation represents the best fit from linear regression.

Comparison of resting pulse rates in chiropractic students versus the general population

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Abstract – Because it is a neurological marker, resting pulse rate (RPR) would seem to be a suitable indicator for a neurological component of chiropractic subluxation. Research indicates that a lower resting pulse rate (RPR) is typically healthier than a higher RPR. A limited amount of research on RPR and chiropractic care warrants further research. The present study compares RPR between: a) a small group of chiropractic students ($n = 17$), who were also chiropractic patients, and b) archived data from a similar group in the general population ($n = 1424$). Both groups consisted of adult white males and were compared using a two sample t test and effect size (pooled standard deviation). The chiropractic group had a mean RPR of 65.2 beats per minute (BPM, standard deviation [SD] = 8.1) compared to the general population group whose mean RPR was 71 BPM (SD 15.1), a difference that was statistically significant ($p = 0.0097$) with a medium strength effect size (of 0.39). Further study with random sampling and an accounting of other potential confounders such as physical fitness is warranted.

Keywords – Pulse rates, radial artery, autonomic nervous system, chiropractic

Introduction

Manual resting heart (pulse) rate (RPR) is a biomarker marker for autonomic nervous system function (Verrier, 2009). In addition, RPR is supported by outcomes research which typically shows that a lower RPR is healthier than a higher RPR (Greenland et al, 1999). Thus, RPR would seem to be a useful clinical assessment for chiropractors who have a neurological focus in their practices (e.g., subluxation-centered chiropractic practice). Limited research indicates that a reduction of RPR following chiropractic care may occur though results vary (Welch and Boone, 2008; Bakris et al, 2007; Zhang et al, 2006). Consequently, further research into chiropractic care and RPR is warranted. The present study compared RPR measurements between a small group of chiropractic student-patients and a similar group from the general population.

Methods

The study was approved by the Institutional Review Board at Sherman College of Chiropractic. RPR data from a convenience sample of 17 chiropractic student patients (CSP) were compared to a reference group ($n = 1424$) from the general population (Ostchega et al, 2011; “general group”). All participants in the CSP group had received prior chiropractic care while an estimated 8% of the general population receives chiropractic care in a given year (Chiropractic, 2012). Both groups consisted of adult white males and were compared using the two sample t test (with the unequal variances option) and effect size (using the pooled standard deviation option). The age range for the CSP group was 22-33 versus the general group range was 20-39. Since the next older age bracket in the general population reference was the same mean as the neighboring younger general group (71.0 BPM in both general groups), the two groups compared in the present study were considered to have similar age ranges.

RPR was taken in the seated position at the radial artery in both groups after at least a period of seated rest (at least 5 minute pre-test rest in the CSP group and approximately 4 minutes pre-test rest in the general group). RPR was taken for 15 seconds in the CSP group (and then multiplied by 4 to achieve a BPM value) and 30 seconds in the general group (and multiplied by 2 to achieve BPM). Differences between count times, after calculating BPM, have not been found to be different statistically speaking (Hwu et al, 2000). Assumptions of the study are: a) the two groups are similar and b) the slight differences in protocol are essentially inconsequential.

Results

The CSP group had a mean RPR of 65.2 BPM (SD 8.1) compared to the general population group whose mean RPR was 71.0 BPM (SD 15.1), a difference that was statistically significant ($p = 0.0097$; power = 82.5%) and a medium strength effect size (of 0.39).

Discussion

Other factors, such as a healthy lifestyle may have contributed to the lower pulse rate in this sample of chiropractic students. Nonetheless, the results of this study suggest that chiropractic care may have been a factor in the chiropractic students' lower resting pulse rates.

Conclusion

This group of chiropractic students showed a lower average resting pulse rate compared to their reference group from the general population. Further study, with an accounting of other possible factors such as physical fitness, is warranted.

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A Comparison of Student Performance Between Lower-Division and Upper-Division Business Courses in Online vs. Traditional Delivery Methods

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Abstract – *The purpose of this research was to fill a void in the literature regarding a comparison of student performance between lower-division business courses and upper-division business courses. Final grade earned in the course was the comparative measure. To ensure consistency and eliminate performance variation the same instructors taught both the online and traditional versions of the respective courses which represented the data. The data analyzed was from one semester of a lower-division core business course and an upper-division course. Analysis of variance was used for the comparisons. No significant differences were found in student performance in the online and traditional venues of the same course, however, a significant difference appeared between the performance of lower-division course students and those in the upper-division course.*

Introduction

The increasing popularity of courses offered to students via the Internet utilizing Web-based instructional mechanisms over the last decade indicates the changing face of how education is being delivered in higher education. Online courses have emerged in not only a variety of disciplines but also at nearly all levels of post-secondary education. Lower-division college classes have long shown lower student performance and retention in colleges and universities nationwide (National Center for Education Statistics, 2002).

Although studies have analyzed the difference in student performance between lower-division business courses and upper-level business courses, there is minimal evidence to demonstrate whether a difference, if any, exists between student performance in lower-division business courses delivered online and traditionally delivered lower-division courses. Additionally, a void in the literature revealed a lack of comparison between student performance in online courses of both lower-division business courses and upper-division business courses. This study was conducted to fill this void.

Literature Review

Higher education and how it is delivered and received is being transformed by the

Internet. Post-secondary institutions are morphing with different technological configurations of instruction as a result of changing student needs and wants in today's world, creating profound implications on student learning outcomes from these changes. As online education continues to grow, a persistent question has justifiably been raised regarding the effectiveness and quality of education in online classes relative to those in a traditional classroom. Evidence that a debate exists can be found in the mixed findings of the literature regarding the effectiveness and impact of the mode of course delivery on student performance outcomes (Gerlich & Sollosy, 2011). On one end of the debate spectrum is a broad consensus among proponents of online learning who conclude that no significant difference exists between the two instructional modalities (Gerlich & Sollosy, 2011; Werhner, 2010). Included among the most cited studies are the longitudinal meta-analyses of 232 studies by Bernard et al. in 2004. Further, in a study by the U.S. Department of Education in 2009, with over 1,000 studies conducted between 1996 and 2008, reported that student performance was better in online courses than in traditional, face-to-face courses (Feintuch, 2010). These studies reflect a change in perception from the findings of a 2000 National Education Association study that found online teaching to be less effective (Nielsen, 2008). Robust negative outcomes were also discovered by Xu & Jaggars (2013) in which an extensive database of 500,000 courses in community and technical colleges was examined.

Within the business discipline literature the research findings are also mixed. A stream of research chronicles a general difference between student performance in lower-division business courses with that of upper-division business courses in the traditional course format only. However there is a void in the literature investigating how students specifically perform in online lower-division business courses versus in a traditional classroom format. There is some evidence that the gap in student performance in upper-division classes is narrowing in accounting

(Jones, Moeeni, & Ruby, 2005). In economics courses, the findings are mixed: Studies showed no negative impact on student outcomes in online versus traditional courses (Bennett, Padgham, McCarty, & Carter, 2012), yet significant differences were found in 2013 by McCarty, Bennett, and Carter. For marketing, Priluck (2004) found no difference in student performance between the two modes of instructional delivery, while Smith and Stephens (2010) revealed that upper-division students perform better in online courses. For upper-division management courses no significant differences were discovered in student performance between the two delivery methods (Wilson & Allen, 2011). In both business statistics and MIS courses, there were no significant differences in student performance between the two teaching modalities (Karth, 2006).

Purpose and Procedures of the Study

The purpose of this study was to examine the differences, if any, between student performance in online courses versus traditional, in-class, face-to-face classes. More specifically this study examined the difference in student performance between a lower-division business core course and an upper-level course for students.

Data were extracted from a database taken from a sample of 645 students pursuing a business degree in four different classes at a Division II state university throughout one semester in an AACSB accredited college of business. Students were from two sections of two distinctly different business courses: a lower-division business course and an upper-division business course. Both courses were taught via the two comparative modes of delivery: traditional (or face-to-face) with the physical presence of an instructor 100% of the time versus online with an instructor communicating through email or web-based instructional technology, chat room or discussion boards and having no physical presence.

The data included 439 students in the lower-division course and 155 students in the online venue of the same course. For the upper-division course, data from 33 students in the traditional manner of delivery was used alongside 18 students in the online class. Control measures were maintained: Specifically, two instructors were involved; the same instructor taught each of the two classes in the lower-division course while a second instructor taught both of the upper-division courses, guaranteeing instructor control across delivery methods within each course. Secondly, content coverage in all classes was identical with the same course requirements for all

classes. Blackboard Learning System (BLS) software was utilized in all classes. Audio/visual lectures were delivered using Adobe Pro Connect. Multiple mechanisms for student/instructor engagement were utilized for including two-way audio, chat, and a Q&A boxes. Attendance in online chat rooms was graded based on the quality and relevance of student comments. Pre-recorded supplemental instruction using Camtasia screen recording was stored on a university server with content accessible 24/7 to students. Identical exams were delivered using the BLS software and a final exam was delivered in a traditional classroom setting. The online exam questions and responses were both scrambled with identical time-limits and were presented to the student one question at a time. The timed aspect of the assessments was critical in decreasing students' use of a textbook or peer collaboration while taking exams online, providing yet another control element for the analysis. Limitations for this study include: an exploratory rather than conclusive approach was taken, only two courses were analyzed from a convenience sample, and each had varying sizes.

The primary focus of the analysis was a comparison of class performance using final grades as the dependent variable. The following hypotheses were developed:

- H1: In the lower-division business courses, there will be no significant difference in final grades between online and traditional courses.
- H2: In the upper-division business courses, there will be no significant difference in final grades between online and traditional courses.
- H3: Between the lower-division and upper-division business courses, there will be no significant difference in final grades between online and traditional courses.

Conclusions

Hypothesis One (H1) focused on lower-division business student performance and investigated the variable of the venue of instruction (online vs. traditional) and student performance as evidenced in their final grades. Analysis of variance results of the final grade scores revealed no significant difference in the final grades of the online vs. traditional class students with $F(1,593) = .025, p = .875 > .05$.

The second hypothesis (H2) examined the upper-division course and whether students performed differently in online versus traditional classes. Analysis of variance of the final grade scores of the upper-division course does confirm this hypothesis. No significant difference was found

in the final grade scores of students of the online course and the traditional course with $F(1,49) = .104, p = .749 > .05$).

Finally, for Hypothesis Three (H3) the focus was on determining a difference between student performance in the two instructional methods and the level of the course, lower-division and upper-division. An analysis of variance of the final grade scores of the lower-division and upper-level course revealed a statistically significant difference in the performance of students from the two courses with $F(1,644) = 6.593, p = .010 < .05$). In summary, in both the lower and upper division business courses comparisons (H1 and H2), there were no significant differences in student performance outcomes, however there was significant evidence that upper-division business students perform better in online-delivered classes than do students in lower-division business classes (H3).

This study set out to contribute to the literature in regard to the continuing academic dialogue about the effectiveness of online course instruction and student performance between lower and upper-division business courses. Despite being conducted at one university, the results of this study do contribute to the larger, ongoing discussion about the efficacy of online course delivery versus traditional face-to-face course delivery. Although this study yields more evidence in the debate over the efficacy of online course delivery, additional research is warranted in other institutions, between lower and upper-division business courses, and for the investigation of more specific demographic variables such as gender, ethnicity, and age.

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Results from Mathematics Developmental Course Redesign

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Abstract – This paper presents first and second year data on students' learning outcomes using redesigned mathematics developmental courses incorporating a learning software system. The data come from pretest/posttest scores measuring basic number sense, arithmetic, and algebraic skills. The setting is a small liberal arts college with a significant percentage of incoming students needing developmental mathematics. Formats include onsite and online classes.

Keywords – Developmental Mathematics, Course Redesign

Introduction

Limestone College is a liberal arts college with about 1050 traditional day students on its main campus in Gaffney, South Carolina. The college also has about 2500 students in its evening program at eight extended campus sites across South Carolina and in its internet program. In fall semester 2012, the college began a revised developmental mathematics program using the Hawkes (Wright, 2012) software learning system. Data on first year results for student learning outcomes were presented by the lead author at the Mathematical Association of America Summer Fest in August 2013. Data collection and analysis were continued through fall semester 2013. This paper presents cumulative results through fall 2013. For information on results of redesign efforts at other institutions, see (National Center for Academic Transformation).

Method

To assess the effectiveness of the redesigned program, question sets (in Respondus) on the mathematics placement test were incorporated into a common final exam for MA 092 (Developmental Mathematics) and MA 093 (Developmental Algebra). This provided for pre/post test results. The first part (Part A) tests number sense and basic arithmetical abilities. The second part (Part B) tests basic algebraic skills.

The common final exam in MA 092 (Developmental Mathematics) uses the question set in Part A of the placement exam. The common

final exam in MA 093 (Developmental Algebra) uses the same question sets as Part A and Part B of the placement exam. The placement test and common final exams in MA092 and MA 093 are non-calculator tests.

Results

Figures 1 and 3 below illustrate significant increases in mean scores as compared with placement test scores for both MA 092 and MA 093. Figures 2, 4, and 6 below illustrate that the distributions of scores shift right with a decrease in the number of outliers to the left, which is a desirable change. Figures 5 and 6 illustrate that the gain in scores for MA 093 is due to significant increase in basic algebraic skills of students, not just improvement in arithmetic skills.

t-Test: Two-Sample Assuming Equal Variances		
	Placement A	Final Exam
Mean	31.38461538	38.72307692
Variance	36.24038462	33.85961538
Observations	65	65
Hypothesized Mean Difference	0	
t Stat	-7.066472802	
P(T<=t) one-tail	4.55937E-11	

Figure 1. Pre/Post Test difference of Means for MA 092 Students. MA 092 (Mean score is on a 50 point test.)

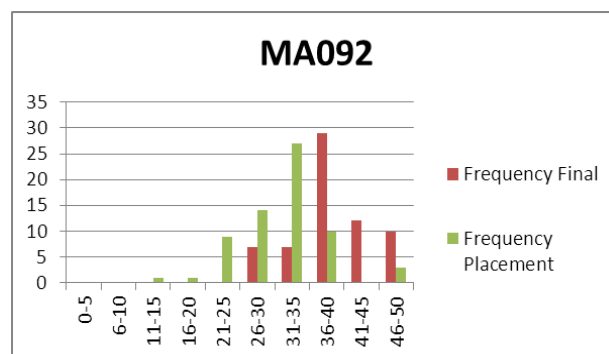


Figure 2. Pre/Post Test Distribution of Scores for MA 092 Students

t-Test: Two-Sample Assuming Equal Variances		
	Total Placement	Total Final
Mean	66.16363636	78.00909091
Variance	101.3674729	106.8806505
Observations	110	110
Hypothesized Mean Difference	0	
t Stat	-8.609095488	
P(T<=t) one-tail	7.40489E-16	

Figure 3. Pre/Post Test difference of Means for MA 093 Students. **MA093** (Mean score is on a 100 point test.)

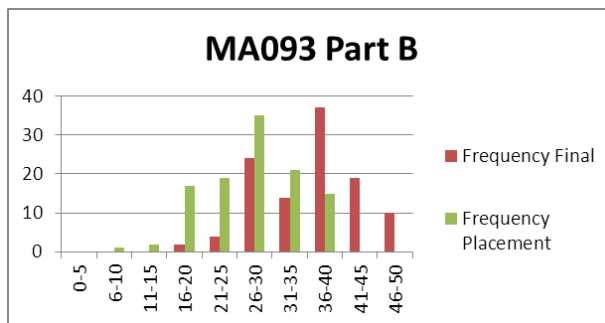


Figure 6. Pre/Post Test Distribution of Scores on Part B for MA 093 Students

Conclusion

Data show a significant increase in mean test scores in final exams in the revised developmental courses versus the students' placement exams prior to taking a developmental course.

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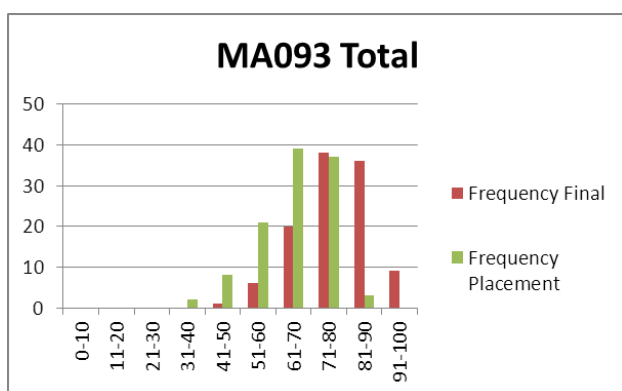


Figure 4. Pre/Post Test Distribution of Scores for MA 093 Students

t-Test: Two-Sample Assuming Equal Variances		
	Placement B	Final B
Mean	27.52727273	36.04545455
Variance	41.02218515	48.19057548
Observations	110	110
Hypothesized Mean Difference	0	
t Stat	-9.458663145	
P(T<=t) one-tail	2.60852E-18	

Figure 5. Pre/Post Test difference of Part B Means for MA 093 Students. **MA 093 Part B** (Mean score is on a 50 point test.)

Multi-User-Virtual Environments Enhances Student Learning

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Abstract – Preparing students to enter the practice environment, educators must develop strategies that encompass the technologies of the 21st century. **Purpose/Framework:** This research explored the effectiveness of the MUVE as a learning tool to improve student learning outcomes. Constructiveness learning and game theories are the theoretical underpinning. **Research Design:** Quantitative quasi-experimental approach consisting of two groups of students enrolled in nursing courses from two campuses. **Sample:** Non-random sampling selected from pre licensure students who volunteer to participate and are enrolled in the first semester nursing course. **Data Collection:** A pre/posttest on oral medication administration scenario was given to both groups. Outcome measures were used which compared the groups. Student (interventional group) engagement and participation level was measured by identifying frequency students enter Second Life (SL), participated and completed the OMAS. **Results:** Thirty-seven students participated in SL. The results on the outcomes measures indicated that students that participation in SL had higher scores on those measures. Students expressed ease of access; simulation to real life; a different way to learn, and a fun activity were the benefits of MUVE. **Conclusion:** This technology allows students to practice, make a mistake, and reflect on their clinical reasoning without risk of harm to real life patient while translating their learning to the hospital environment.

Keywords – Virtual World, Nursing Education, Constructiveness Learning, Second Life, Simulation

Introduction

Providing students with multiple and varied means of learning in the complex world of nursing and preparing them to meet the demands of the dynamic healthcare environment is a critical role for today's nurse educators. In order to adapt to the changing characteristics of today's nursing students, nursing education must also embrace and apply technology to support student success in nursing programs. It is imperative that educators create opportunities to engage students in a world that draws them in and entices them to become a more active learner. The creation of nursing healthcare complex in a multi-user virtual environment (MUVE) using Second Life© provides an interactive, guided patient, family and healthcare team experience. The student selects an avatar identity in the virtual world and is

transported to a simulated healthcare system to care for simulated clients and families. In this environment, avatar students develop nursing process skills and clinical reasoning without risking patient's safety and without experiencing undue stress or anxiety. In addition, skills such as therapeutic communication, assessment, prioritization of care, patient safety, and professional behaviors can be taught in a way that allows the student to recognize patterns.

The potential of the MUVE is tremendous as a learning environment by providing opportunities for students to practice real-life patient scenarios in a virtual safe environment (Broom, 2009; Brown, et al., 2012, and Dutile, et al., 2011). Students of today are more comfortable with technology, social networking and the internet. There have been a number of studies indicating that the use of MUVE has a positive effect on learning both in social interaction, cognitive higher order thinking, knowledge acquisition, and knowledge construction (Beard, Wilson, Mora, & Kellan, 2009; Dass, et al., 2011; de Freitas, et al. 2010; Jarmon, Traphagan, Mayrath, & Trivedi, 2009; Mayrath, Traphagan, Jarmon, Trivedi, & Resta, 2010). Based on constructivist learning theory and serious gaming concept it engages and challenges students. Cconstructivist and online collaborative learning theories offer concepts that can be used to construct distant and virtual world educational programs and learning opportunities. The inclusion of game theory (Aldrich, 2009; Bauman and Games, 2011; Bronack, et al., 2008; Burguillo, 2010, and Wang and Chen, 2010) enhances engagement and motivation adding to increased student involvement and collaboration in their learning.

Problem/Research Question

Does the MUVE, as an augmented learning tool, provide an effective method to support successful achievement of the program learning outcomes (critical thinking, competency, communication, and professional behavior)? Will students, who experience the virtual world nursing education environment as an augmentation of the traditional methods (lecture/podcasting, textbook, clinical experiences) of learning, have a greater

level of engagement in their learning process as compared to the student learning through traditional methods?

Methodology

This abstract focuses on phase II of a two phased research study. Phase II is investigating if the use of an MUVE would enhance student learning. A patient scenario for oral medication administration scenario (OMAS) was developed based on Safe Medication Administration principles to evaluate these behaviors of critical thinking, competency of specific skills, therapeutic communication, and professional behavior.

Sample

The sample will be drawn from 47 students' enrolled (experimental group) in a first semester skills class and who volunteer to participate. Sixty-five students enrolled in a similar course at a separate campus of the same Southeastern University, was the control group. The students in the experimental group were given a pictorial training manual and provided one-on-one training to assist them in developing the skills necessary to navigate and interact with the virtual world, healthcare complex, and the oral medication scenario. Students were given access to MUVE (avatar name and password) and provide instructor led training sessions. The study was approved by the Institutional Review Board (IRB) approval of the University of South Carolina.

Data Collection

Level of participation in the OMAS was measured for all students in the intervention group. An oral medication administration scenario (OMAS) pre-test was administered four weeks into the semester, and a post-test was administered at the end of the semester (3 months later) to the experimental and control groups. In addition, test scores on the unit medication test and scores for medication question on the final exam will be compared.

Results

A sample consisting of 108 students, 47 in the interventional group and 62 in the control group participated in the study. Thirty-one students of the interventional group actively participated in Second life (SL). The posttest mean scores were higher; $p < .05$ for those students who participated in SL. The results on the comprehension outcome measures demonstrated that the participation in SL resulted in higher scores, with $p < .01$. When

measuring the program outcomes, it was found that students who participated in SL scored greater in the areas of communication, competency and critical thinking, but not in professional behavior. Students identified, in rank ordered, time, technical difficulties, navigation, and orientation to the scenario as barriers to SL participation. The benefits that the students acknowledged were ease of access, simulation to real life, a different way to learn, and a fun activity.

Discussion/Conclusion

In this study, it was evident that MUVE provides an effective learning opportunity for the student to comprehend the principles of safe oral medication administration. Creating a realistic experience for students allows them to apply the knowledge of oral medication administration as well as interacting with the patient. When students immerse themselves into a realistic patient environment, they are able to engage in the behaviors that require critical thinking, competency, therapeutic communication, and professional role behavior.

The results in this study showed statistically significant changes in mean scores between the pretest and posttest of those who participated in the oral medication administration scenario. The higher mean scores on the pretest for the interventional group compared to the control group are not clearly understood. These results demonstrate when the student is willing to commit the time to learn, be supported by immediate feedback, and simulate the student's competitive nature, they will learn. As students immerse themselves in a virtual learning environment, they are able to reinforce their knowledge of the principles of medication administration. As stated by Nickolaou & Tsolakidti (2013), de Freitas, et al., 2012 and Bronack, et al., 2008, learning takes place when students can engage in their own learning. The virtual world provides students with an environment that is self-directed, enjoyable, and realistic enough that they can apply and practice the principles and tasks associated with nursing such as administration of oral medications.

The results show that students who engaged successfully in the OMAS were able to meet the learning outcomes (competency, critical thinking, and communication) and achieve success in administering oral medications. They had to exercise critical thinking through the selection of appropriate medications and dosage the study needed to be able to communicate effectively with patients to solicit essential information required for safe administration of oral medications, and they

had to demonstrate knowledge and competency when assessing the appropriateness of the medication and the actions of administering those medications. Though the results did not demonstrate that the students met the learning outcomes of professional role, they did comment “this made me feel like a real nurse”, a particularly powerful statement in socializing students to the new profession of nursing. Codier and Holt (2012) found that interacting with the patient to solve problems helps the student develop professional behaviors.

Wankel & Kingstey (2009) report that learning to navigate the virtual world one of the major drawbacks in adapting this technology into the curriculum. Wankel and Kingstey (2009) suggest that a learning tool that provides information that includes basic information on avatar design dressing the avatar, maneuvering, and developing support systems to help the student with events that are not normally found in traditional learning environments. The students in this study reflected this concern with placing time as a major barrier to participating in the exercise. The development of a ‘how to’ video, providing activities such as games, scavenger hunts, and other activities to support how to maneuver, find, and operate with this environment would reduce this learning. Lastly, having students more involved in the designing and implementation stages would use the student’s creativity and encourage greater involvement by them.

Conclusions

MUVE is an effective learning tool to permit the student to learn and practice, then transform learning into new knowledge and behaviors. MUVE provides students with a realistic environment that allows them to practice, make mistakes, reflect, test their analytic skills, and learn from their experiences in a safe environment. Students who actively engage in their learning demonstrate greater comprehension, critical thinking, effective communication, and competency --- practice of being a nurse. MUVE encourages students to recognize patterns, be instructed in manageable steps of conceptual learning, and develop essential competencies. In immersive environments students are given a realistic opportunity to connect abstract knowledge and apply that knowledge to practical situations.

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Evaluating Teacher-Training Programs: Do Praxis II Scores and GPAs Predict Teacher Effectiveness?

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Abstract – *This research presents an analysis of candidates' performance on Praxis II tests and course grades. Using correlation coefficients, all coursework GPAs included in this study had a weak to moderate relationship with the candidates' Praxis II Core Test performance and four of the seven classes' GPAs had weak to moderate correlations with the Praxis II LD Test. The outcomes are to assist program improvement by identifying conditions that positively impact candidates' achievement and teacher competency.*

Keywords – *Teacher preparation, GPA, Certification examinations.*

Introduction

In 2001 Congress enacted the No Child Left Behind (NCLB) Act, a mandate for reform of teacher education that is unprecedented in its scale. As part of the NCLB Act, all fifty states must demonstrate elevated student achievement levels as well as employ *highly qualified* teachers in each classroom. Therefore, it is imperative that institutions of higher education are confident that their teacher preparation programs train candidates to meet the demands of today's public school systems. The challenge facing education reformers in teacher preparation is determining how pre-service teacher candidate effectiveness can be accurately assessed in order to improve the teacher workforce. Under the guidelines of the Individuals with Disabilities Education Act of 2004, the qualities used to define teacher competency include being knowledgeable about the variety of students' conditions as well as possessing the abilities to meet the children's individual needs. The proposed research addresses these challenges by investigating the utility of two metrics currently employed to define teacher candidates as highly qualified and eligible for licensure: Grade Point Average (GPA) and Praxis II scores. This research investigated whether candidates' completion of coursework from a fully approved Learning Disability (LD) Program indicates a relationship with the candidate performance on the state required Praxis II examinations. Specifically, the study addressed the following two research questions. Do individual total course GPAs of prepared special education teachers completing core coursework required for licensure in LD

significantly relate to their Praxis II exam (Core and LD) total and/or domain scores? And 2) do individual course GPAs of prepared special education teachers completing coursework offered by other certification areas significantly relate to their Praxis II® exam total and/or domain scores?

Teacher Preparation

Teacher quality is predicated on the notion that an educator's ability to deliver instruction in the classroom successfully hinges on proficiency in knowledge and skills gained prior to entry into the profession and hence on the need for licensure programs. Teacher training programs with national recognition by NCATE and TEAC in turn establish coursework offerings that align with professional standards and accreditation requirements. Commonly the institutions gauge candidates' performance in terms of a) the completion of a state-approved program of study, b) the GPA earned for each course required, and c) the score earned on tests for licensure. Given these prerequisites, one would hope that candidates' level of success in completing the state/University requirements links with the candidates' level of teaching success.

Conflicting data however exist on the predictive validity of GPA on teacher effectiveness (Davy, Doolan, & Higgins, 2007). One portion of research supports the use of GPA as a criterion for measuring teacher classroom effectiveness, as well as suggests that GPA is generally a valid and reliable predictor of teacher performance (see Bacon, & Bean, 2006; Gore, 2006; Graham, & Garton, 2003; Roth, BeVier, Switzer III, & Schippmann, 1996). However, other studies showing no correlation between GPA and teacher effectiveness assert that grades are biased and variable across instructors, classes, and institutions, thereby unreliable indicators of actual or potential performance (see Glass, 2002; Kane, Rockoff, & Staiger, 2006; Zumwalt, & Craig, 2005). As a means to control for the threats of bias and inconsistency, this project used longitudinal data (2000-2012) representing candidates' GPA performance from 10 graduation cohorts of the same program to determine whether candidates' GPAs serve as a measure of teacher effectiveness as

reflected by their Praxis II scores.

An analysis of candidates' standardized tests scores may provide additional predictors of teacher performance as well as further alleviate the alleged drawbacks associated with GPA data research. In a meta-analysis D'Agostino and Powers (2009) examined the degree to which teachers' scores on basic skills tests and their performance in preparation programs, as measured by their collegiate GPA, predicted their teaching competence. Results from 123 studies (1905-2004) suggest that test scores were at best modestly related to teaching competence and that performance in preparation programs was a significantly better predictor of teaching skill. Despite their far-reaching analysis, "No newer test forms (such as the Praxis II series or Pearson tests) based on more contemporary pedagogical approaches or more updated measures of teacher effectiveness were included", p. 152. The lack of attention to the efficacy of the Praxis II exams remains a lacuna in teacher preparation research and a point of interest for curriculum evaluation here at USC Upstate.

Methods

To address the study's research questions, the project capitalized on databases available through USC Upstate (GPAs), ETS (Praxis II scores), and the South Carolina Department of Education (Professional Practice Status). Since its first graduating class in 2002, the LD Program has had 149 graduates. According to the SC Department of Education, 114 of these graduates are *Highly Qualified Teachers* practicing in this state and were included in this study. Because ETS does not provide sub-tests scores for test takers prior to 2012, these scores had to be directly obtained from the candidates. As a result, the total number of participants was reduced to 92.

The correlation coefficient was used to measure of the strength of relationship between variables. This includes the LD Program coursework: LD Characteristics (Char), LD Methods (Meth), Special Education Assessment (As) LD Curriculum (Curr) LD Reading (Read) and LD Language (Lang). Behavior Management (BM) is a required class offered by the Elementary Program. The GPAs are based on a 4.0 scale (A = 4, B+ = 3.33, B = 3, C+ = 2.33 and C = 2). Candidates cannot continue in the LD Program with Program grades lower than a C. The grades were compared with two Praxis II tests. The Education of Exceptional Children (Core) includes three sub-tests: Domain I: Understanding Exceptionalities (UE), Domain II: Legal and Societal Issues (LS) and Domain III: Delivery of Services to students with Disabilities (DEL),

whereas the Education of Exceptional Students Learning Disabilities exam includes the sub-tests Domain I: Learner Characteristics- Historical & Professional Context (LC), Domain II: Delivery of Services (DEL), and Domain III: Problem Solving Exercises (PSE).

Results

The correlation coefficient values between 0 and 0.3 indicate a weak positive linear relationship between 0.3 and 0.7 a moderate positive linear relationship, and between 0.7 and 1.0 a strong positive linear relationship (Ratner, 2013). All coursework GPAs included in this study had a weak to moderate relationship with the candidates Praxis II Core Test performance, including the total GPAs that were compared to the tests' three domain scores (See Table 1). An additional analysis of significance was performed to determine the probability that the observed results would be highly unlikely under the null hypothesis (i.e., no statistically significant correlations between the course GPAs and Praxis II® total and/or domain scores of candidates who completed licensure in LD). The correlations between four of the seven course total GPAs and the Praxis II Core Test were significant.

The correlations between the Praxis II LD Tests and the LD Program coursework were weak to moderate for four of the classes. Three classes had a correlation with the Test total or Domain scores that are considered significant (See Table 2). The LD Language, LD Reading, and the Elementary Program's Behavior Management had no relationship with the tests' scores, whereas the LD reading and LD Language class had moderate correlations with the Praxis II Core Test that are significant.

Conclusions

Correlations exist between the course GPAs and Praxis II® total and domain scores of candidates who are teachers in LD. In several cases these relationships were statistically significant. The recognition of these correlations provides a starting point for examining the Program's content through its alignment with national accreditation standards. For example, one could investigate why the Assessment course had a correlation with only one of the two tests' domains scores and the LD Language class had a correlation with only two of the three domains. It is not surprising that the Elementary Program's behavior management class had no correlation with the LD Praxis and a weak correlation with the Praxis Core Test. This finding may reinforce that the necessity of providing candidates with specialized training in their specific

field and not others with which they are only loosely aligned.

Acknowledgements

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Tables

Table 1: Praxis II Core v. Coursework GPAs

		Char	Meth	BM	As	Curr	Read	Lang	Total
		GPA	GPA	GPA	GPA	GPA	GPA	GPA	GPA
	N	92	92	88	91	88	92	91	84
Praxis II® Core Total	r	0.377	0.238	0.240	0.360	0.280	0.442	0.393	0.469
	p	0.00*	0.022*	0.024*	0.720	0.008*	0.000*	0.000*	0.000*
Praxis II® Core Dom I (UE)	r	0.171	0.127	0.184	0.028	0.245	0.357	0.281	0.300
	p	0.101	0.224	0.085	0.791	0.021*	0.000*	0.006*	0.005*
Praxis II® Core Dom II (LS)	r	0.097	0.138	0.027	0.072	0.220	0.233	0.175	0.208
	p	0.352	0.187	0.800	0.483	0.394	0.024*	0.096	0.017*
Praxis II® Core Dom III (DEL)	r	0.403	0.263	0.262	0.072	0.223	0.331	0.327	0.404
	p	0.000*	0.011*	0.013*	0.354	0.036*	0.001*	0.001*	0.000*

— indicates a weak positive linear relationship * Significance, $p \leq .05$

— **Bold indicates a moderate positive linear relationship**

Table 2: Praxis II LD v. Coursework GPAs

		Char	Meth	BM	As	Curr	Read	Lang	Total
		GPA	GPA	GPA	GPA	GPA	GPA	GPA	GPA
	N	89	88	84	87	88	88	86	81
Praxis II® LD Total	r	0.226	0.353	-0.078	0.293	0.270	0.169	0.191	0.2845
	p	0.032*	0.000*	0.479	0.005*	0.010*	0.127	0.077	0.010*
Praxis II® LD Dom I (LC)	r	0.331	0.373	0.114	0.117	0.249	0.056	0.193	0.273
	p	0.001*	0.000*	0.300	0.277	0.019*	0.598	0.074	0.013
Praxis II® LD Dom II (DEL)	r	0.275	0.283	0.104	0.192	0.235	0.176	0.103	0.295
	p	0.009*	0.007*	0.346	0.073	0.026*	0.100	0.344	0.007
Praxis II® LD Dom III (PSE)	r	0.140	0.116	-0.020	0.312	0.202	0.088	0.097	0.188
	p	0.189	0.026	0.853	0.004*	0.058*	0.414	0.369	0.091

— indicates a weak positive linear relationship * Significance, $p \leq .05$

— **indicates a moderate positive linear relationship**



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Shoreline Change Analysis of Seabrook Island, SC

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Abstract – *Seabrook Island is a barrier island located approximately 28 km south of Charleston, South Carolina. As a residential and resort area, Seabrook Island is important to the economic health of the Charleston, SC, region. Portions of Seabrook Island are impacted by accelerated erosion, which has been combated with engineered stabilization methods, inlet relocation, and beach nourishment. Despite stabilization attempts, local shoreline erosion is continuing, leading to potential economic and ecological loss to the island. We used the Digital Shoreline Analysis System (DSAS) to determine long- and short-term erosion rates on the island, focusing on natural and anthropogenic changes to the beach. Our results take into account major natural and anthropogenic impacts, determined by comparison to historical maps, aerial photographs, and satellite imagery. Our results show that since 1939, Seabrook has experienced erosion up to 48.5 m/yr at the northern end of the island, accretion of up to 9.6 m/yr on Seabrook Beach, and moderate to severe erosion of up to 10.4 m/yr near the southern end of the island.*

Keywords – Shoreline Erosion, Barrier Island, Linear Regression Rate, Geographic Information Systems

Introduction

Coastal areas have been historically vulnerable to erosion, and many coastal areas with both economic and environmental importance are experiencing significant erosion. The offshore, barrier, and sea islands of southern Charleston County, SC, show patterns of active erosion and accretion, with erosion currently dominating in most areas (Pilkey and Dixon, 1996; Pilkey et al, 1998). Many of the barrier islands that are actively eroding in Charleston County have undergone erosion control including structural methods such as groins and seawalls, as well as a series of beach renourishments costing over \$351 million (Kana, 2012). This includes structural control methods and renourishment on Seabrook Island in southern Charleston County, SC. Engineering efforts to attempt to slow the rate of erosion on Seabrook Island are ongoing (Eiser, 2012).

The effectiveness of structural and non-structural erosion control methods on coastal erosion and accretion is a matter of much discussion and investigation. Structural control methods, while often effective at protecting

property on-shore, usually result in significant erosion and loss of the beach (Pilkey and Dixon, 1996; National Research Council, 1990; Levine et al, 2009). Although the shoreline change analysis has been a topic of study for decades (Fenster and Dolan, 1996; Robertson et al, 2007; Shoshany and Degani, 1992; Thieler and Danforth, 1994), the development of statistical shoreline analysis using digital imagery has significantly advanced studies of shoreline change, its causes, and its impacts around the world (BaMasoud and Byrne, 2011; Haunani et al, 2012; Nebel et al, 2012; Salvatore et al, 2012).

Understanding the rates of erosion on Seabrook Island, the impacts of erosion control methods, and the time frame over which those processes occur will assist interested parties, including the State of South Carolina, Charleston County, the South Carolina Department of Natural Resources (SCDNR), the United States Geological Survey (USGS), the Environmental Protection Agency (EPA), and the U.S. Fish and Wildlife Service (USFWS) to develop management plans for the island. It should be noted that that Seabrook Island is of significant economic and environmental importance to the State of South Carolina. Data from 2008 indicates that Charleston County tourism contributed \$1.6 billion to South Carolina tourism revenue and supported over 20,000 jobs in that year (SCIWAY, 2011). The bulk of these revenues and jobs are in the downtown and coastal communities, including the residential and resort areas of Seabrook Island.

Barrier islands like Seabrook also protect the mainland from the impacts of storms such as hurricanes. Not only do the island's marshlands absorb some of the excess water generated in large storms, but the island acts as a "speed bump" of sorts, attenuating storm surge waves and robbing them of energy. The maritime forests on Seabrook have the same impact on damaging winds, often taking the brunt of their energy and weakening the storm before it reaches the mainland. Seabrook Island is also important because of the wildlife species it supports. Some species breed and nest on the island, while many others winter on the island from as far away as South America. Several species that nest on the islands are listed as threatened

species under the Endangered Species Act, including the piping plover, loggerhead sea turtles, bald eagles, the least tern, and the Wilsons plover (USFWS, 2012).

Methods

We completed a statistical analysis of shoreline rate-of-change on Seabrook Island, SC, using the Digital Shoreline Analysis System (DSAS) within the ArcGIS Geographic Information System (GIS) platform. DSAS is computer program that computes rate-of-change statistics from multiple historic shoreline positions (Theiler et al, 2009). We identified, recorded, and entered the locations of historic shorelines of the island, compiled from aerial photography and satellite imagery and dating back to 1939, into a Geographic Information System (GIS) database.

Using the DSAS program, we created a baseline offshore of the island and projected a series of spaced transect lines from the baseline across the mapped historic shorelines of the island. Transect parameters were set using 50 m spacing with 1500 m long transects to ensure all mapped historic shorelines were crossed by the transects. A total of 162 transects were cast to cover the areas of interest. DSAS recorded the location where the individual transects cross the digitized historic shorelines and provided measurements of erosion, accretion, and areas of stable shoreline around the islands. Once transects were established and measurement of shoreline change was calculated, we used DSAS to run statistical analyses on portions of Seabrook Island that are impacted by artificial erosion control.

We calculated statistics in two areas on the northern end of the island near Captain Sams Inlet, one area along Seabrook Beach, and in two areas at the southern end of the island along North Edisto Inlet near the Seabrook Resort and Beach Club. We chose these areas of interest because of their history of erosion, the use of different types of erosion control methods, and the potential negative impacts of sustained erosion in these areas. Using DSAS, we calculated and analyzed the Net Shoreline Movement, Linear Regression Rate, and Weighted Linear Regression Rate to determine amount and rate of shoreline erosion and accretion in the areas of interest. Using the DSAS program, we identified overall rates of shoreline change and pinpointed specific areas of vulnerability to erosion for Seabrook Island. We ran statistics over several different time frames to focus on anthropogenic changes to the beach. Analyses were run, for example, on shoreline dates prior to seawall construction at the Seabrook Beach Club, and then

re-run for shoreline dates following seawall construction to attempt to identify impacts of the seawall on the beach.

Results

Our results show that Seabrook is experiencing episodes of severe erosion up to 48.5 m/yr at the northern end of the island near Captain Sams Inlet, accretion of up to 9.6 m/yr on Seabrook Beach, and moderate to severe erosion of up to 10.4 m/yr near the southern end of the island. Much of the erosion is in areas that have experienced structural erosion control, while areas of accretion were subject to non-structural control methods, including beach renourishment. We found the highest erosion rates at Captain Sams Inlet, where inlet migration and the loss of ebb-tidal delta shoals are occurring. Erosion is also being experienced on the southern tip of the island around the Beach Club and North Edisto Inlet, which has a history of engineered erosion control including groins and a seawall. Although North Edisto Inlet is much more stable than Captain Sams Inlet, inlet dynamics and changes in Deveaux Bank, the emergent ebb-tidal delta off of North Edisto Inlet, have caused periods of erosion. Seabrook Beach tends to be accretional, with only short periods of erosion associated with natural and anthropogenic activities.

Conclusions

The shoreline of Seabrook Island is complex and variable due to the natural and anthropogenic forces acting on the coast. Seabrook Island has been subject to tropical and extratropical storms, sea-level rise, and human activities including construction of hard structures, inlet relocations, and beach scraping and renourishments. Our results indicate that the areas of Captain Sams Inlet and the Beach Club are experiencing erosion, while Seabrook Beach is experiencing accretion. Inlet dynamics near Captain Sams Inlet and the Beach Club (North Edisto Inlet) are the main cause of erosion. The erosion at Captain Sams Inlet, however, as well as impacts on the Captain Sams' ebb-tidal delta by both natural and anthropogenic relocations of the inlet, have provided a source of sediment to Seabrook Beach through longshore drift and bar and shoal welding. In addition, renourishment of the beach has also helped Seabrook Beach remain stable to accretionary. While the structures at the Beach Club are protected by a seawall, DSAS shows that the area is losing beach in front of the seawall at a significant rate.

Our case study of shoreline erosion at Seabrook

Island employs analysis of historical aerial photographs and maps, coupled with statistical techniques. We attempt to quantify, and ultimately forecast, local shoreline erosion and accretion rates using a GIS-based, Digital Shoreline Analysis System (DSAS), a method that is relatively rapid and simple to use. We found that many rate-of-change values are highly uncertain, especially near inlets, and may be inaccurate in light of likely climate change and sea level rise. We nevertheless believe that these analytical methods can be applied and tested at barrier islands elsewhere in order to potentially better forecast the rate and magnitude of future shoreline change.

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Abundance of Carnivorous Mammals in Urban Greenways and Rural Forests

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Abstract – Small mammals often face a high risk of predation in urban environments, particularly from feral and domestic cats (*Felis domesticus*). Other predators in urban forests include gray foxes (*Urocyon cinereoargenteus*), red foxes (*Vulpes vulpes*) and coyotes (*Canis latrans*). Our previous work suggests that white-footed mice face a greater risk of predation within urban greenways than rural forests of Spartanburg County. We sought to determine if predators are more prevalent within these urban greenways than rural forests. We surveyed carnivorous mammals in urban and rural forests using wildlife cameras. Three cameras were placed in riparian habitat in urban greenways and three cameras were placed in rural forests. All six sites were located in Spartanburg County, SC. During June - August of 2013, cameras were baited with a 1:1 mixture of catnip oil and canola oil. The cameras were then left unbaited for September - December of 2013. Feral and domestic cat detections were rare and there was no significant difference in cat activity between catnip-baited and unbaited wildlife cameras. In addition, we did not find a significant difference in activity for any carnivore species between urban greenways and rural forests. There was, however, a non-significant trend for greater coyote and red fox activity in urban greenways. Our results suggest that small mammals within urban greenways in Spartanburg may face a low risk of predation from feral and domestic cats.

Keywords – Carnivore, Urban Greenway, Predation, Cats

Introduction

Birds and small mammals often face a high risk of predation in urban woodlands, particularly from feral and domestic cats (*Felis catus*; Mitchell and Beck, 1992). For example, migratory songbirds nesting within suburban woodlots in Tennessee and Maryland had a 70.5% nest predation rate, while the predation rate in rural woodlands was just 47.5% (Wilcove, 1985). More recently, Lloyd *et al.* (2013) attached video cameras to domestic cats and found that they prey upon small mammals in urban woodlands, particularly during October - March. In addition to their effect on abundance, cat predation may also alter the species composition of small mammal populations within urban and suburban woodlands. Hawkins *et al.* (1999) found that the presence of feral and domestic cats in urban woodlands facilitated the movement of non-

native house mice (*Mus musculus*) into populations.

Domestic and feral cats are not the only predators found in urban woodlands. In fact, native predators can also be more prevalent in urban areas than within rural forests. Oftentimes, these native predators exploit anthropogenic food sources to achieve relatively higher densities (Bateman and Flemming, 2012). Common examples in North America include the coyote (*Canis latrans*), red fox (*Vulpes vulpes*), eastern striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), and opossum (*Didelphis virginiana*).

Our previous capture-mark-recapture work suggests that white-footed mice (*Peromyscus leucopus*) living in urban greenways within Spartanburg, SC have reduced survival relative to mice living in rural forests (Johnson *et al.* 2011). In the current study, we asked the following questions: 1) Do urban greenways have a higher abundance of mammalian carnivores than rural forests? and 2) Is baiting wildlife cameras with catnip oil a more effective method for surveying the abundance of feral and domestic cats than using unbaited cameras?

Materials and Methods

Study Site Description

We surveyed riparian habitat in 3 urban greenways within the city of Spartanburg, SC and 3 forests in rural Spartanburg County. Urban greenway sites were located at the Upper Chiquapin Greenway, Edwin M. Griffin Reserve, and the campus of the University of South Carolina Upstate. Rural forests sites were at the Peter's Creek Heritage Preserve and the Pacolet River Heritage Preserve. Habitat at each site primarily consisted of riparian oak-hickory forest.

Catnip-Baited Wildlife Cameras

We placed one motion-activated wildlife camera at each of the 6 study sites from June - August, 2013. Cameras were secured to a tree at approximately 1 m height within habitat likely to contain carnivore activity (*e.g.* along a game trail or near a drainage containing pools of water). Cameras were set to take a digital picture when

movement in front of the camera triggered the sensor. During this period, cameras were baited with a 2 mL solution of 1:1 catnip oil (F&T Trading Post, Alpena, MI) and canola oil. The mixture was applied to a cotton ball, which was then placed in a 4 oz plastic container with vent holes on the lid and sides for air flow to carry the catnip scent into the environment. The catnip was replaced every 10 days. This cup was secured 1.5 m high in a tree that was 5 - 10 meters in front of the camera.

Unbaited Wildlife Cameras

During September – December of 2013, we left each camera in the same location, but removed the catnip bait. Cameras were checked every 3-4 weeks for replacing SD cards.

Event Scoring

Each digital picture contains a time and date stamp, allowing us to determine the activity time of each photographed individual. We scored events for the catnip and unbaited periods separately, following the protocol of Kelly and Hollub (2008). Briefly, an event occurred when a mammal walked in front of the camera and triggered the camera to take a picture. If two pictures of the same species occurred within 30 minutes of each other, and the animals were not distinguishable, they were scored as a single event. If multiple individuals occurred in the same photograph, however, each individual counted as a separate event. We adjusted the total event score at a site based on the number of operable camera days (*e.g.* correct for battery failure). In addition, to allow for comparisons across sites and baiting periods, we generated a standardized event score per 100 days using the equation below:

$$\text{Event Score} = \left(\frac{\text{Number of events}}{\text{Number of days during trapping session}} \right) \times 100$$

We compared event scores between the catnip and unbaited periods using a Wilcoxon signed-rank test. A site was only included in the pairwise comparison if an event occurred during either the catnip or unbaited periods. We then created a combined event score for both the catnip and unbaited periods (June – December). A Mann-Whitney U test was used to compare the activity of each carnivore species within urban greenways and rural forests. All analyses were performed in Systat 12 and we adjusted for alpha inflation using the Holm-Bonferroni method (Holm, 1979).

Results

During both the catnip and unbaited periods, the most commonly encountered species was the whitetail deer (Table 1). Domestic cat activity was low and we found no significant difference in the

number of domestic cat events between the catnip and unbaited periods ($Z = 1.342$, $p = 0.180$). Similarly, catnip was neither a significant attractant nor a deterrent to the activity of coyotes ($Z = 1.069$, $p = 0.285$), domestic dogs ($Z = 0.447$, $p = 0.655$), gray foxes ($Z = 1.342$, $p = 0.180$), opossums ($Z = 0.944$, $p = 0.345$), raccoons ($Z = 0.363$, $p = 0.173$), or red foxes ($Z = 1.604$, $p = 0.109$).

There was no significant difference in the number of domestic cat events between urban greenways and rural forests ($U = 4.000$, $df = 1$, $p = 0.796$). Likewise, we found no significant difference between urban greenways and rural forests in the activity of coyotes ($U = 9.000$, $df = 1$, $p = 0.0370$, adjusted $\alpha = 0.00714$), domestic dogs ($U = 4.000$, $df = 1$, $p = 0.796$), gray foxes ($U = 7.500$, $df = 1$, $p = 0.121$), opossums ($U = 3.000$, $df = 1$, $p = 0.513$), raccoons ($U = 3.000$, $df = 1$, $p = 0.513$), or red foxes ($U = 9.000$, $df = 1$, $p = 0.0370$, adjusted $\alpha = 0.00833$).

Discussion

Contrary to our expectation, catnip was not a significant attract for feral and domestic cats. We think, however, that this is mostly the result of low cat activity at our study sites. Catnip has been shown to be an effective attractant for feral and domestic cats in other studies (Clapperton *et al.* 1994). Our results also suggest that using catnip to attract cats does not bias the detection of other carnivore species at study sites.

Similar to Gehrt *et al.* (2010), we found a trend for coyotes and red foxes to be more abundant within urban greenways than at rural forest sites. Our results, however, were not significant following correction for alpha inflation. Our results agreed with Gompper *et al.* (2006) in that dogs are not an abundant predator within urban woodlands. Smith and Engeman (2002) found that raccoons were more abundant within urban habitats than in rural forests. We did not find a significant difference in raccoon abundance between greenways and rural forests, but raccoons were highly abundant at the Upper Chiquapin Greenway. Their abundance at Chiquapin may relate to the narrowness of this greenway, which has been found to foster high densities of raccoons (Sinclair, 2005).

Conclusions

We found that feral and domestic cats were rare within both urban greenways and rural forests. Our data suggest that coyote, red fox, and gray fox activity may be higher in urban greenways than at rural forests, but we will need to obtain more data to confirm a significant difference. Our results have low statistical power and we will be adding more study sites in the future to gain a better

understanding of carnivore activity within urban greenways.

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Table

Table 1. Event score (standardized as number of events per 100 days) for mammals encountered using wildlife cameras at three urban greenways and three rural forests in Spartanburg County, SC. The catnip baiting period occurred during June-August, 2013, while the unbaited period was September-December, 2013. (Numbers indicate mammals encountered: 1 = Coyote, 2 = Domestic Cat, 3 = Domestic Dog, 4 = Gray Fox, 5 = Opossum, 6 = Raccoon, 7 = Red Fox, 8 = Whitetail Deer, and 9 = Unidentified)

	Site/Bait Period	Species								
		1	2	3	4	5	6	7	8	9
Urban Greenways	Chinquapin Catnip	1.1	1.1	0.0	0.0	11.4	87.5	1.1	0.0	3.4
	Chinquapin Unbaited	0.0	0.0	1.0	20.2	45.5	96.0	4.0	6.1	4.0
	Cottonwood Catnip	0.0	0.0	0.0	0.0	0.0	1.2	0.0	21.4	3.6
	Cottonwood Unbaited	0.8	0.0	0.0	0.0	0.0	4.9	0.8	64.2	3.3
	Upstate Catnip	2.3	0.0	0.0	2.3	6.8	8.0	0.0	9.1	1.1
	Upstate Unbaited	1.0	0.0	0.0	5.8	11.7	6.8	1.0	39.8	5.8
Rural Forests	Pacolet South Catnip	0.0	0.0	0.0	0.0	1.3	3.8	0.0	26.6	0.0
	Pacolet South Unbaited	0.0	0.0	0.0	0.0	3.8	13.2	0.0	80.2	3.8
	Pacolet North Catnip	0.0	1.3	1.3	0.0	7.6	1.3	0.0	10.1	1.3
	Pacolet North Unbaited	0.0	0.0	0.9	0.0	4.7	21.7	0.0	107.6	9.4
	Peter's Creek Catnip	0.0	0.0	0.0	0.0	2.4	8.5	0.0	19.5	1.2
	Peter's Creek Unbaited	0.0	0.0	0.0	0.0	0.9	3.5	0.0	48.3	0.0

Impact of nocturnal temperature variation on the calling activity of *Anaxyrus fowleri*, *Hyla chrysoscelis*, and *Hyla cinerea*

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Abstract — Temperature influences anuran calling activity and the Piedmont region experiences large changes in diurnal versus nocturnal temperatures most months of the year. We conducted a study that investigated the magnitude of temperature change at four Piedmont wetlands from sunset to 01:00 and how the temperature changes impacted the calling activity of *Anaxyrus fowleri*, *Hyla chrysoscelis*, and *Hyla cinerea* inhabiting the wetlands. We used Automated Recording Systems (ARSs) to obtain air temperatures and sound files from our study wetlands. We assessed anuran calling activity by completing call surveys of the ARS sound files. Analysis of Variance indicated that the average temperatures at 0:45 were significantly lower than the average temperatures at 21:15 for all wetlands. The decrease in air temperature appeared to be biologically relevant, as it was associated with a decrease in the calling activity of each species. Our next step is to increase the complexity of our statistical analyses in a way that allows us to examine how multiple variables interact to affect calling activities of our focal species. In addition, we hope our results help inform the design of large scale anuran monitoring programs.

Keywords — Anurans, North American Amphibian Monitoring Program, amphibian decline

Introduction

Anuran (i.e., frogs and toads) often experience extreme population fluctuations (Alford & Richards, 1999; Green, 2003). However, several recent changes in anuran population dynamics (e.g., shifting breeding seasons and susceptibility to disease) have been linked to range reductions and loss of species (Blaustein *et al.* 2001; Corn & Fogleman, 1984; Daszak *et al.* 1999; Todd *et al.* 2011; Pounds & Crump, 1994). Anuran population decline is occurring globally (Gibbons *et al.* 2001; Pounds, 1994; Walther *et al.* 2002), and the scientific community has responded by developing programs to inventory and monitor anuran occurrence across large spatial scales (Bridges & Dorcas, 2010; MacKenzie *et al.* 2002). We participate in one such program, the North American Amphibian Monitoring Program (NAAMP), managed by the United States Geological Survey. The NAAMP established standardized call survey protocols designed to maximize detection of anuran species across large

regions of North America (Weir *et al.* 2005). Although the protocol appears adequate for detecting certain species, recent studies demonstrated that the NAAMP call survey parameters may underestimate occurrence of anurans in some areas (Cook *et al.* 2011; Tupper *et al.* 2007). For example, Hayes *et al.* 2013 found that decreases in calling activity of *Anaxyrus fowleri* (Fowler's Toad), *Hyla chrysoscelis* (Cope's Gray Treefrog), and *Hyla cinerea* (Green treefrog) from sunset to one in the morning (the timeframe specified by NAAMP for conducting call surveys) increased the sampling effort necessary to detect the anurans in the Piedmont region of South Carolina.

Temperature influences anuran calling activity (Tupper *et al.* 2007; Weir *et al.* 2005; Yull *et al.* 1956) and the Piedmont region experiences large changes in diurnal versus nocturnal temperatures most months of the year. Thus, we suspected that the reduction in calling activity documented by Hayes *et al.* (2013) may be associated with decreasing temperatures through the timeframe allowed for completing anuran call surveys. Several studies support the idea that thermal influences may outweigh temporal influences on anuran calling activity (Oseen & Wassersug, 2002; Readings, 1998). Thus, the major goal of our current study was to investigate the association between temperature and calling activity of *A. fowleri*, *H. chrysoscelis*, and *H. cinerea*. Our three specific objectives were to (1) evaluate the magnitude of temperature decline from sunset to one in the morning at the four wetlands that were the focus of the Hayes *et al.* (2013) study, (2) determine if the average temperature at sunset was significantly higher than the average temperature at one in the morning at each wetland, and (3) investigate if decreases in temperatures were associated with decreases in calling activity of *A. fowleri*, *H. chrysoscelis*, and *H. cinerea* at each wetland.

Materials & Methods

Evaluating Temperature Change

As part of our ongoing work (see Hayes *et al.* 2013), we have automated recording systems

(ARSS) at four wetlands (named Cleveland, Ludwick, Patterson, and Scotsgrove) in Spartanburg County. We programmed the ARSS to record air temperature every 15, 30, and 45 minutes each hour. To evaluate the degree that temperatures changed at our study wetlands, we exported the ARS temperature files from the 21:15, 21:45, 22:15, 22:45, 23:15, 23:45, 00:15, and 00:45 time periods from May 13th – June 17th, 2012 into EXCEL (Version 15) for data management and analysis. Please note that the May and June dates overlapped with the NAAMP Sampling Window 3 for the Piedmont region of South Carolina and corresponded to the dates of the Hayes *et al.* 2013 study. We visually inspected trends in temperature change through time for each wetland by plotting time against average temperature at each time during the 35 day study period. We used Analysis of Variance (ANOVA) to determine if the average temperature at 21:15 was significantly higher than the average temperature at 0:45 at each wetland.

Evaluating the Association Between Temperature and Anuran Calling Activity

We completed anuran call surveys by listening to five-minute ARS sound files recorded at the 21:30, 22:30, 23:30 and 0:30 time periods from May 13th to June 17th, 2012. Each time we heard *A. fowleri*, *H. chrysoscelis*, and *H. cinerea* calling in the sound files, we recorded the species as present. If the species was not heard, we recorded the species as absent. For each species, we calculated its frequency of occurrence in call surveys by taking the number of surveys with the species calling and dividing it by the total number of surveys (n=35 at each time period at each wetland). To assess the degree that frequency of occurrence was associated with temperature at the survey times, we calculated the average temperature at each time period that call surveys were completed (see Table 1). We then plotted the frequency that each species was detected in our surveys against the four temperature readings associated with the call survey times.

Results

On average, air temperature at each wetland decreased through time (Figure 1). Analysis of Variance indicated that the average temperature at 0:45 was significantly lower than the average temperature at 21:15 for all wetlands (Table 1). Thus, we documented a statistically significant decrease in air temperature through the night at wetlands across Spartanburg County. In addition,

the decrease in average air temperature at each time period (Table 2) appeared to be biologically relevant, as it was associated with a decrease in the calling activity of each species (Figures 2-4).

Conclusions

As suspected, air temperatures significantly decreased from sunset to one in the morning at our study wetlands. In addition, we demonstrated that decreases in temperatures were associated with decreases in calling activity of *A. fowleri*, *H. chrysoscelis*, and *H. cinerea*. Our results were not surprising, as previous research has demonstrated temperature impacts both anuran calling activity (Weir *et al.* 2005) and the quantitative characteristics of anuran vocalizations (Zweifel, 1968). Our three focal species in our region are late season breeders that predominantly call from above the water (i.e., the treefrogs) or at the land-water interface (i.e., the toads); thus, it made sense that as air temperatures dropped, their calling activity dropped.

Our study represented the first look at thermal impacts on anuran calling activity at our study wetlands. Our next step is to increase the complexity of our statistical analyses (e.g., use logistic regression analyses) in a way that allows us to examine how multiple variables (i.e., time of night, temperature and wetland) interact to affect calling activities of our focal species. In addition, we hope our results help the USGS refine NAAMP survey protocols for our region. One possible solution is to relax the protocol requirement that survey stops must be completed sequentially through the night.

Acknowledgements

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Tables & Figures

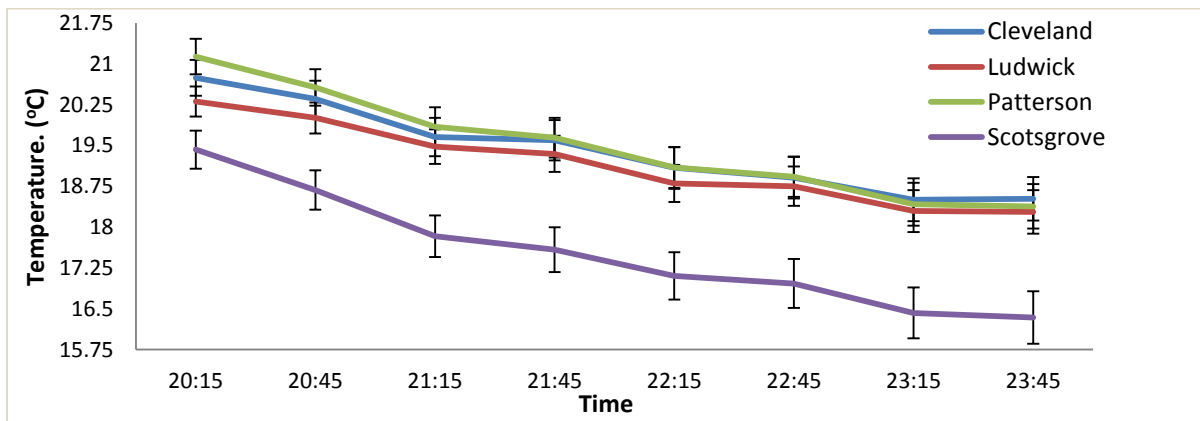


Figure 1. \bar{x} air temperatures decreased through time at the study wetlands (N = 35 nights at each time at each wetland; \bar{x} are presented ± 1 SE).

Table 1. ANOVA indicated \bar{x} temperatures at 21:25 were significantly higher than \bar{x} temperatures at 0:45 (df = 1,68 for all analyses).

Wetland	\bar{x} Temp @ 21:15	\bar{x} Temp @ 0:45	F	p - value
Cleveland	20.7°C	18.5°C	17.9	< 0.001
Ludwick	20.3°C	18.2°C	16.8	< 0.001
Patterson	21.1°C	18.4°C	26.9	< 0.001
Scotsgrove	19.4°C	16.3°C	26.3	< 0.001

Table 2. Summary of \bar{x} temperatures at temperature recordings 21:30, 22:30, 23:30, and 0:30.

Wetland	21:30	22:30	23:30	0:30
Cleveland	20.4°C	19.5°C	18.9°C	18.4°C
Ludwick	20.0°C	19.3°C	18.7°C	18.2°C
Patterson	20.8°C	19.7°C	18.9°C	18.3°C
Scotsgrove	19.0°C	17.6°C	16.9°C	16.3°C

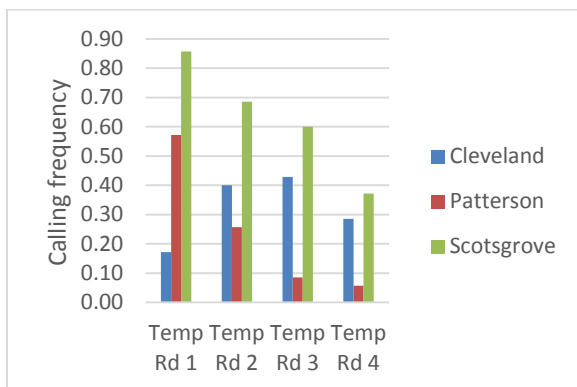


Figure 2. The effect of temperature on calling frequency of *Anaxyrus fowleri*. (The \bar{x} temperatures at each Temperature Reading for each wetland can be found in Table 2).

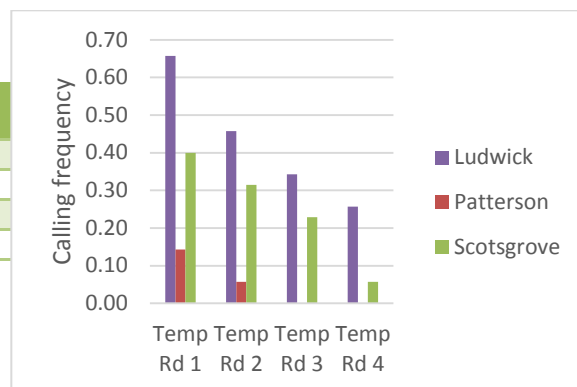


Figure 3. The effect of temperature on calling frequency of *Hyla chrysoscelis*. (The \bar{x} temperatures at each Temperature Reading for each wetland can be found in Table 2).

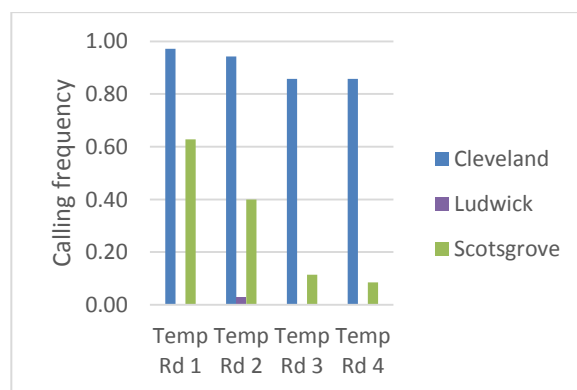


Figure 4. The effect of temperature on calling frequency of *Hyla cinerea*. (The \bar{x} temperatures at each Temperature Reading for each wetland can be found in Table 2).

Impact of Eastern Hemlock (*Tsuga canadensis*) Loss Caused by Hemlock Woolly Adelgid (*Adelges tsugae*) Infestation on Soil, Stream and Freshwater Macroinvertebrate Ecology

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Abstract – Eastern hemlock (*Tsuga canadensis*) a native, evergreen conifer, has been devastated by the invasive, non-native hemlock woolly adelgid (*Adelges tsugae*). This study assessed the effects of hemlock loss on the soil, stream, and freshwater macroinvertebrate ecology at two nearby sites (one dominated by live hemlocks: “alive site”, another by recently dead hemlocks: “dead site”) in a forested region of the southern Appalachian Mountains near Sylva, NC. All differences observed between the two sites were consistent with previous studies. Statistically-significant differences at 0.05 level included (a) overall mean soil pH, (b) mean soil pH measured at 20 centimeters from the base of the tree, (c) mean soil moistures measured at 52 and 112 centimeters from the tree base at a depth of 13.5 cm, and (d) mean soil temperatures measured at 20 centimeters from the base of the tree at a depth of 13.5 centimeters. Concerning observations regarding freshwater macroinvertebrates, a statistically-significant, greater proportion of Ephemeroptera and Plecoptera macroinvertebrates, shredders, predators, and collector–gatherers were found at the alive site compared to the dead site. In contrast, a statistically-significant, greater proportion of Trichoptera macroinvertebrates and collector–filterers were found at the dead site compared to the alive site.

Keywords – hemlock woolly adelgid, hemlock loss, soil, stream, macroinvertebrate

Introduction

Eastern hemlock, *Tsuga canadensis*, is a “native, evergreen conifer with heavily foliated and upsweeping branches” (Carey 1993). At maturity, it commonly has a height of 18-21 meters and a diameter at breast height of 61-122 centimeters. Hemlocks have been devastated by *Adelges tsugae* – the invasive, non-native hemlock woolly adelgid, also referred to as HWA. Various studies (Evans *et al.* 2012; Colburn *et al.* 2009; Webster *et al.* 2012; Orvis *et al.* 2009; Orwig *et al.* 2006; Snyder *et al.* 2002) have shown how the loss of hemlock has and will impact the environment, both locally and nationally. This study assessed the effects of the loss of hemlock on the soil, stream, and freshwater macroinvertebrate ecology. HWA was first reported in Richmond, Virginia in 1951. Since that date this “aphid-like” insect has caused considerable damage to the hemlock population across the Eastern

United States. Hemlocks, which can live to be over 800 years, are dying within 3 to 6 years after infestation (USDA Forest Service 2005). According to the National Park Service over the last ten years as many as 80 percent of the hemlocks on the Blue Ridge Parkway have died due to HWA infestation (National Park Service 2012). According to Hollingsworth and Hain (1991: 184), hemlock mortality is associated with lower xylem pressure potentials, which increases the rate of cavitation of sapwood tracheids, accelerating heartwood formation. The excessive heartwood formation in turn disrupts sap movement, leading to the mortality of the hemlock.

Investigation Procedure

Over a period of four days from August 25, 2013 through August 28, 2013, between 11:30 am and 1:30 pm each day, water temperature and pH, soil moisture, pH, and temperature, and air temperature at both dead and alive sites were measured. Water temperature and pH were measured in the stream closest to each site as well as roughly 13.5 m downstream from each site. Soil moisture and temperature were measured by excavating three 18 cm deep holes at each site near the base of selected hemlocks. These holes were situated 20, 52, and 112 cm from the base of each tree. Soil moisture and temperature were measured at two depths in each hole: 3.5 and 13.5 cm. Soil pH was measured from soil samples collected from each of the excavated holes at the 13.5 cm depth. In the first and third day measurements were made first at the alive site, followed by measurements at the dead site.

Freshwater macroinvertebrates were collected from the streams adjacent to and 13.5 m downstream from both sites using a D-net. The macroinvertebrate samples were collected as pooled samples, which are multiple grabs from the environment from different locations. Three samples were collected from each site during the first and third day, resulting in a total of six (6) pooled samples. The D-net was placed under debris dams, where rocks and debris were shifted and picked up allowing the debris, along with

macroinvertebrate samples, to flow into the D-net. The samples were placed into 4-dram vials with conical polyethylene lined screw caps containing 80 percent ethyl alcohol to preserve the macroinvertebrate samples and taken to the Environmental Studies laboratory at Wofford College, where they were emptied into white pans and sorted into groups based on physical similarities which could be seen by the naked eye. Using a Wolfe® Intermediate LED Stereomicroscope with Dual Magnification (10x and 20x) and the Fourth Edition of *An Introduction to the Aquatic Insects of North America*, edited by Merritt *et al.* (2008), 115 macroinvertebrate organisms from the alive site and 192 organisms from the dead site were identified. Some of the samples were identified down to the genus. However, due to damage done to some of the samples during the handling process, some specimens could only be identified down to family. The habit and trophic relationships of each macroinvertebrate were noted using the tables of the summaries of ecological and distributional data for each order, prepared by Merritt *et al.* (2008). The macroinvertebrates were counted to calculate the composition of the samples for each site.

Conclusions

Hemlocks have been devastated by HWA. This study assessed the effects of the loss of hemlock on the soil, stream, and freshwater macroinvertebrate ecology at two sites (one dominated by live hemlocks, another by recently dead hemlocks) within Balsam Mountain Preserve near Sylva, NC. The study illustrates that the loss of hemlock has a discernible effect on various properties including soil pH, macroinvertebrate community composition, subsurface soil temperature, and subsurface soil moisture, but not on stream temperature or stream pH. Shredders dominate at the alive site whereas collector-filterers dominate at the dead site.

More specifically,

- Consistent with previous study (Evans *et al.* 2012), the ambient air temperature at the dead site was higher compared to the alive site, however, not at a statistically significant 0.05 level. The absence of significance can be attributed to either the relatively recent mortality of hemlocks at the dead site or the small sample size. In addition, long-term succession of hardwoods at the dead site can mitigate the temperature difference.
- Consistent with previous study (Evans *et al.* 2012), the overall mean soil temperature for the dead site was higher compared to the alive

site. This difference, however, was not statistically significant at 0.05 level. More detailed depth/distance-specific comparisons revealed a statistically significant difference in mean soil temperature at 20 centimeters from the base of the tree at a depth of 13.5 centimeters.

- The overall mean soil moisture was 4.98% higher in the alive site when compared to the dead site. This difference, however, was not statistically significant at 0.05 level. More detailed depth/distance-specific comparisons revealed statistically significant soil moisture differences of 23.75% and 9.125% at 52 and 112 centimeters from the tree base at a depth of 13.5 cm, respectively.
- Consistent with previous observations (Orwig *et al.* 2006 and McCauley *et al.* 2003), the results for overall mean soil pH showed a statistically-significant, lower mean soil pH (0.55 less) at the dead site compared to the alive site. Soil samples collected 20 centimeters from the base of the tree showed an even larger statistically significant difference in pH between the alive and dead site. The soil pH at the dead site being lower by 0.919.
- Consistent with previous study (Orvis *et al.* 2009), no statistically significant difference at a 0.05 level was found between the mean water temperature of the alive and dead sites. However, the mean water temperature (by the site and downstream combined) was slightly higher at the dead site with a difference of 0.37°C.
- Consistent with previous study (Orvis *et al.* 2009), no statistically significant difference at 0.05 level between the mean stream pH of the dead and alive sites was found. The mean water pH (by the site and downstream combined) was slightly lower at the dead site when compared to those measured at the alive site.
- Consistent with previous study (Colburn *et al.* 2009), *Trichoptera* constituted a statistically significant larger percentage in the dead site (53.1%) when compared to the alive site (19.1%).
- Consistent with previous observations (Colburn *et al.* 2009), a statistically-significant, greater proportion of *Ephemeroptera* macroinvertebrates were found at the alive site compared to the dead site.
- There is statistically significant difference at 0.05 level in the proportion of *Plecoptera* macroinvertebrates between the two sites. *Plecoptera* accounted for 77.4% of the sampled specimens at the alive site, whereas *Plecoptera*

accounted for only 42.2% of the sampled specimens at the dead site.

- Inconsistent with previous studies (Webster *et al.* 2012 and Snyder *et al.* 2002), a statistically-significant, greater proportion of shredders were found at the alive site. 80% and 36.5% of the specimens from the alive and dead sites were shredders, respectively.
- Consistent with previous observations (Snyder *et al.* 2002), a statistically-significant, greater number of predators were collected at the alive site compared to the dead site. 22.6% of the samples at the alive site were predators against only 5.7% at the dead site.
- A statistically-significant, higher number of collector–filterers were found at the dead site compared to the alive site. The percentage of collector–filterers in the dead site is 57.8% against only 17.4% at the alive site.
- Consistent with previous study (Colburn *et al.* 2009), a statistically-significant, greater proportion of collector–gatherers were found at the alive site.

These major findings confirmed those previously reported in published works, emphasizing the impact of hemlock loss on the ecosystem.

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Identification and Characterization of *Pythium* Species Associated with Cotton field soil in South Carolina

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Abstract — Seedling diseases cause the largest yield losses of any cotton disease in the United States. In South Carolina, seed and seedling mortality of cotton have been mainly attributed to *Pythium ultimum*. Other *Pythium* spp., even reported, has been poorly characterized. During the summer of 2012-2013, 103 isolates of *Pythium* were recovered from a field yearly planted with cotton in Hartsville, SC. *Pythium* isolates were identified by means of morphological features and molecular tools (DNA sequence). Eighty-seven *Pythium* isolates were successfully identified to species level. *Pythium irregulare* was the dominant species recovered from cotton soil. Representative isolates of *P. irregulare* were further characterized by the pathogenic ability on cotton seeds and sensitivity to the fungicide treatment, metalaxyl. Fifty-eight percent of the total isolates of *P. irregulare* were highly pathogenic to cotton seeds. Seed rot and root rot symptoms were observed. Sensitivity to metalaxyl varied among isolates. Sensitivity was observed for both sub-lethal doses of the fungicide. Stimulation of mycelial growth was also observed in some isolates. The main goal of this project was to better understand and possibly expand the knowledge on the number of *Pythium* species potentially associated with poor seed germination in cotton fields in South Carolina.

Keywords — *Pythium*, Cotton, Seedling diseases, Metalaxyl

Introduction

Upland cotton (*Gossypium hirsutum* L.) is susceptible to numerous fungal diseases including those affecting the seed and the seedling stage (DeVay *et al.*, 1982, Jones *et al.*, 2011). Seed rot and pre-emergence damping-off of cotton seedlings in South Carolina have been mainly attributed to *Pythium* species particularly *P. ultimum* occurring on early planted cotton or cotton planted in cool- and wet soils. Damage to plants may vary from barely detectable to death with an overall yield reduction for South Carolina cotton growers of 3 to 5 percent every year (Jones *et al.*, 2011). The costs to growers are even higher when crop replanting is necessary. Despite the vast attention dedicated to *P. ultimum* as primary pathogen in seedling disease development, the pathogenic ability of some other *Pythium* species recovered from cotton soils and affected plants is still unclear and underreported.

Currently, there are no varieties that offer any level of resistance to seedling diseases. Disease management relies on the integration of cultural practices and fungicides application (Rothrock *et al.*, 2012, Wang and Davis, 1997). However, these practices seem to be threatened by the occurrence of *Pythium* strains resistant to fungicides (Branter and Windels, 1998, Broders *et al.*, 2007, Garzón *et al.*, 2011, Mazzola *et al.*, 2002, Moorman and Kim, 2004, White *et al.*, 1998).

The purpose of our project is: a) to identify *Pythium* spp. recovered from natural cotton field soil and b) to characterize *Pythium* spp. recovered based on pathogenic ability on cotton and sensitivity to the widely used fungicide treatment, metalaxyl (Ridomil Gold®).

Methodology

Pythium isolation and Identification

Pythium-like isolates were recovered from a cotton field in Hartsville, South Carolina during summer 2012-2013. *Pythium* isolates were recovered by placing 10 g of soil onto a *Pythium* selective medium (P₅ARP). This procedure was replicated five times. Fungal colonies identified as *Pythium*-like based on morphology were re-isolated in Corn Meal Agar (CMA) and 5-7 days old colonies were kept in water storage at 22^oC in dark conditions.

All the *Pythium* isolates recovered from cotton field soil were identified based on morphological features using pertinent taxonomical keys. In addition, sequencing of the internal transcribed spacer (ITS) sequence from at least one representative isolate of each species was sequenced to confirm identification and to further assist with identification of isolates which did not produce morphological traits. For this purpose, *Pythium* DNA was purified using the UltraClean® Microbial DNA Isolation Kit according with manufacturer instructions. DNA purification was performed by Microcon Millipore technology. Sequencing was done at the Clemson University Genomic Institute at Clemson University (Clemson, SC). MI). Sequence data was compared with known sequences deposited in the National Center for

Biotechnology Information (NCBI) to confirm morphological identification.

In vitro test for sensitivity to metalaxyl (Ridomil Gold®)

Twenty isolates representing the dominant *Pythium* species recovered, *P. irregulare*, were tested for sensitivity to metalaxyl (Ridomil Gold®). Briefly, corn meal agar (CMA) was amended with 0 (control), 0.1, and 100 µg a.i (active ingredient) metalaxyl ml⁻¹ and poured in 9-cm petri plates. A 6-mm-diameter disk from each representative isolate was transferred then to the medium containing the selected fungicide concentrations. Fungicide concentration was selected due to previous reports on several crops with *Pythium* isolates showing resistance to the fungicide at those levels. Plates were incubated in the dark at 22°C. After 48 h, linear growth of oomycete colonies was measured to determine sensitivity to metalaxyl. The experiment was conducted twice.

Pathogenicity assays

Randomly selected isolates of *P. irregulare* recovered from cotton field soil were tested for their pathogenic ability on cotton seeds. A seed plate assay, similar to that used by other studies to evaluate pathogenicity of *Pythium* on soybean, corn and alfalfa was used (DeVay *et al.*, 1982). Each selected isolate was grown on 2% water agar for 72 h or until it fully covered the Petri plate. After that, 10 cotton seeds (Variety: MRC-270) were placed onto the colonized culture medium. Plates were incubated for 7 days at 22°C in dark conditions. Each isolate was scored for pathogenic ability using the following rating scale: 0 = 100% germination with no symptoms of infection; 1 = 70 to 99% germination with lesion formation on the roots; 2 = 30 to 69% germination with coalesced lesions; and 3 = 0 to 29% germination, where all seed tissues were colonized. Isolates with a pathogenicity score from 0 to 1, 1 to 2, or 2 to 3 were considered to have a low, moderate, or high level of pathogenicity, respectively (Broders *et al.*, 2007). There were three replicate plates for each isolate in each experiment and the experiment was conducted two times.

Statistical analysis

Statistical analysis for the fungicide sensitivity trials and pathogenicity assays were conducted using the SAS program. Analysis of variance was performed using the GLM procedure. Means were compared and separated at P=0.05 according to Fisher's least significant difference (LSD) and Dunnet's means comparison method.

Summary of Findings

Out of the 103 *Pythium*-like isolates recovered, a total of 87 isolates were successfully identified as *Pythium* spp. The dominant species recovered from cotton soil was *P. irregulare*, a reported pathogenic species of cotton. Thirty-one isolates of *P. irregulare* were selected to evaluate the pathogenic ability on cotton seeds and roots. *In vitro* seed assays showed that 42% (13/31) of the isolates presented no significant reduction of the germination rate compared with the control. However, 58% (18/31) of the isolates were pathogenic to cotton, showing a significant reduction of seed germination and visible root rot lesions, compared to the control. Out of the total pathogenic isolates, 83% (15/18) were highly pathogenic (Germination rate < 29%) while 17% (3/18) of the isolates showed a low pathogenic ability (Germination rate > 70%) on cotton. Out of the 31 isolates of *P. irregulare* tested for pathogenic ability on cotton seeds, a subset of 20 isolates were selected for further evaluation of sensitivity to the fungicide, metalaxyl. Sensitivity to sub-lethal doses of metalaxyl ranged from 28 to 92% growth reduction at 1 µg/ml and 48 to 98% growth reduction at 10 µg/ml, compared to the control. The highest concentration of metalaxyl tested in culture (10 µg/ml) significantly stimulated the growth of some isolates (Py.I50, Py.I58, Py.I66, Py.I70) by 27 to 40% growth compared to the control. At 1 µg/ml, only one isolate, Py.I66 was significantly stimulated by 50% growth compared to the control. The isolates showing stimulated growth by metalaxyl showed no pathogenic ability on cotton seeds *in vitro*.

Conclusions

P. irregulare was the dominant species recovered from cotton fields during 2012-2013 in Hartsville, SC. *P. ultimum*; the main pathogenic species reported affecting cotton worldwide, was not recovered during this study by traditional culture-based methods. Further studies should include a combination of culture- and sequence-based identification methods to enhance our understanding of *Pythium* communities in cotton soil and reduce the potential bias of culture-based recovery. Furthermore, *in vivo* pathogenicity and fungicide sensitivity trials should be conducted in order to simulate the natural field environment where the interaction occurs.

Our results support previous findings (Branter and Windels, 1998, Broders *et al.*, 2007, Garzón *et al.*, 2011, Mazzola *et al.*, 2002, Moorman and Kim, 2004, White *et al.*, 1998) showing that sensitivity of

Pythium spp. to metalaxyl as well as growth stimulation, represent a major concern for disease management.

Acknowledgements

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Factors Influencing Seed Germination for *Linum rigidum* (Yellow Stiff Flax)

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Abstract – We investigated the efficacy of two techniques, cold, moist stratification and application of exogenous hormones in breaking seed dormancy of *Linum rigidum* (yellow stiff flax). These conditions for germination in *L. rigidum* have not previously been reported. We were also interested in whether surface sterilization affects seed germination rates. In the study focused on effects of stratification, we divided seeds into six groups, three surface-sterilized and stratified for zero, one or two months, and three not surface-sterilized and stratified for the same time periods. The seeds not stratified were placed in replicate Petri dishes under fluorescent lights, while the others were stratified at 7 °C for appropriate durations, prior to being placed under lights. We monitored germination for up to ninety-nine days. Seed germination rate did not significantly differ with surface-sterilization. Germination occurred slowly and sporadically in all groups; however, longer stratification duration significantly decreased germination rates. In a second study, we tested the effect of two hormones, gibberellic acid and cytokinins on germination rates of seeds not subjected to cold stratification. We found that germination occurred more quickly in the presence of gibberellic acid at two concentrations (1000 mg L⁻¹ or 100 mg L⁻¹), but was unaffected by cytokinin (215 mg L⁻¹). Results indicate that *L. rigidum* seeds experiences physiological dormancy but cold stratification does not break dormancy.

Keywords – seed germination, surface-sterilization, cold stratification, physiological dormancy

Introduction

Seed germination is a critical period in the life cycle of many plants. Germination signals may exhibit adaptations such that germination occurs when environmental conditions are suitable for seedling establishment (Cavieres & Arroyo 1999). Germination begins at the time of maternal testa (seed coat) rupture, and ends when the radicle becomes visible (Weitbracht *et al.* 2011). To initiate this process in seeds with dormancy there has to be a release of dormancy. Suitable external environmental conditions, such as appropriate amounts of light, temperature and moisture required by the embryo, determine the release of physiological dormancy. When seeds stay moist during the time of germination it allows imbibition, which keeps the seed hydrated and increases

metabolic activity for energy and growth in later development (Weitbracht *et al.* 2011). The genus *Linum* has been reported in a non-peer reviewed source (Geneve, accessed 2013) to exhibit non-deep physiological dormancy, which is characterized by dormancy that is induced or mediated by the plant hormone ABA. While ABA plays a role in inducing and perhaps maintaining dormancy, gibberellic acid plays a role in breaking dormancy or inducing germination in seeds that have lost dormancy (Baskin & Baskin 2004). Treating *L. rigidum* seeds with a form of gibberellins might be effective in breaking dormancy and promoting germination, as this treatment has been used effectively in other species (e.g. Machado de Mello *et al.* 2009). Additionally, cytokinin, another plant hormone, may also promote germination by counteracting effects of inhibitors (Kahn 1971).

Linum rigidum (yellow stiff flax) is an annual wildflower native to the mid-western states of North America, a region that is dominated by temperate climate. Flowers emerge in May, which means seeds are exposed to cold to mild winters. Cold stratification breaks down the seed coat and accelerates germination rates, which may be particularly important in plants from a temperate zone (Cavieres & Arroyo 1999). Although, to our knowledge, there are no formal studies on seed germination for *L. rigidum*, a seed catalog (Prairie Moon Nursery accessed 2013) advises cold stratifying the close relative *Linum sulcatum* for two months in moist conditions to break dormancy, and a non-peer reviewed database suggests that other congeners (*Linum capitatum*, *L. dolomiticum*, and *L. narbonense*) germinate sporadically over several months after being sowed at cold temperatures, less than 5 °C (Clothier 2013). Surface-sterilization is another technique shown to boost germination rate, by reducing fungal growth in seeds (Sauer & Burroughs 1986).

We conducted two separate experiments to determine their effects on germination rate in *L. rigidum* seeds. The first experiment we cold-stratified and surface-sterilized seeds, and the second experiment we applied gibberellic acid and cytokinins exogenously to seeds.

Methods

Cold stratification and surface-sterilization

We used 240 *L. rigidum* seeds each for surface-sterilization and not surface-sterilization treatment groups. Within these two groups seeds were further divided into zero-month (control group), one-month, and two-month cold stratification periods. To surface-sterilize seeds, we placed them in a microcentrifuge tube and soaked them for eight minutes in a 0.5 % bleach solution, followed by rinsing three times with sterilized water. We then transferred seeds onto a 60x15 mm Petri dish that contained moistened sand, which was also sterilized by autoclaving. We had a total of eight dishes per treatment, and stored them in separate sealable plastic bag (one treatment per bag). We placed the bags containing zero-month seeds directly under fluorescent lights (a mix of pink and blue spectra), and bags with seeds for cold-stratification treatments in the refrigerator (7 °C), for appropriate durations. After each stratification period, we moved bags to the fluorescent lights. We recorded germination every two four days up to at least ninety-nine days, after stratified seeds were moved to the florescent lights. Seeds were remoistened as needed. We removed any seeds with fungal growth, or seeds that were initially included, but later determined to lack an embryo (not potentially viable). Germinated seeds were defined as showing an emerging radicle from the seed coat. We calculated the average proportion of germinated seeds for all six treatment groups; however, there were no significant difference between seeds that were surface-sterilized and ones that were not were found, so we combined the two groups. We then determined the average proportion of germinated seeds for each stratification treatment and analyzed the data using chi-square after time periods of 22 days, 48 or 49 days, 69 – 71 days, and 99 – 101 days.

Gibberellic acid hormones and cytokinin

To investigate the effect of hormones on germination, we surface sterilized seeds then soaked them overnight in 500 mL of distilled water (control), 1000 mg L⁻¹ gibberellic acid (high gibberellins), 100 mg L⁻¹ gibberellic acid (low gibberellins), or 215 mg L⁻¹ of kinetin (cytokinin). The next day, we divided seeds into 8 petri dishes with 12 seeds apiece lined with moistened filter paper, and we placed dishes in sealable plastic bags under fluorescent lights at room temperature. One week later, we began monitoring germination every three or four days over a 41-day period. Any seeds that developed fungi were removed. To determine whether germination rates differed between

treatments, we summed the cumulative germinated seeds as well as the total seed pool (excluding any seed that developed fungi during the course of the experiment) across all dishes within each treatment. We then tested whether the proportion germinated differed among treatments on the 14th, 28th and 41st (final) day of the study.

Results

Cold stratification and surface-sterilization

For all treatments, germination occurred slowly (Fig 1), and after about 80 days, seem to level off. There was no significant difference in cumulative germination rates after 99 days, between sterilized and not sterilized seeds within cold stratification, though a marginally significant difference occurred for seeds stratified for one month ($\chi^2 = 3.08$, d.f. = 1, $P = 0.08$), with higher germination rates in the sterilized group. Chi-square analyses of cumulative average proportion of germinated seeds after 22 days, and 48 – 49 days showed no significant difference among treatments. However, there was a significant differences after 68-71 days ($\chi^2=10.75$, d.f. = 2, $P = 0.005$) and after 98 – 101 days ($\chi^2=20.38$, d.f. = 2, $P < 0.001$), with the highest germination rates in the non-stratified group and lowest germination rates in the two-month stratification group.

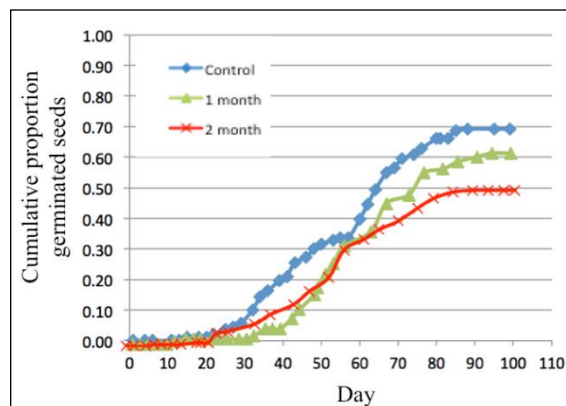


Figure 1. Average cumulative proportion of germinated *Linum rigidum* seeds for 99 – 101 days after initial exposure to light. Cold-stratification periods: 0-month (N=140), 1-month (N=131), and 2-month (N=116)

Gibberellic acid hormones and cytokinin

Fourteen percent of seeds showed evidence of fungal infection and were excluded from analyses. Seeds had germinated in all treatments by the first survey date, and germination continued in the control and cytokinin treatments through the end of the experiment. Germination rates were similar in both gibberellin treatments and initially higher

than in the control and cytokinin treatment (Fig 2); germination rates slowed in the gibberellin treatments as the number of ungerminated seeds remaining decreased. Germination rates were significantly different for all three days tested (χ^2 range 23.3 – 46.7, $df = 3$, $P < 0.001$ for all three tests), with higher, similar germination rates in the two gibberellin treatments and lower, similar germination rates in the control and cytokinin treatments. Germination of non-gibberellin-treated seeds continued throughout the duration of the study, and the positive slope of the cumulative germination curves suggests that germination would have continued had the study been extended. Germination rates per dish decreased to near zero midway through the study in the gibberellin treatments because very few seeds remained available to germinate.

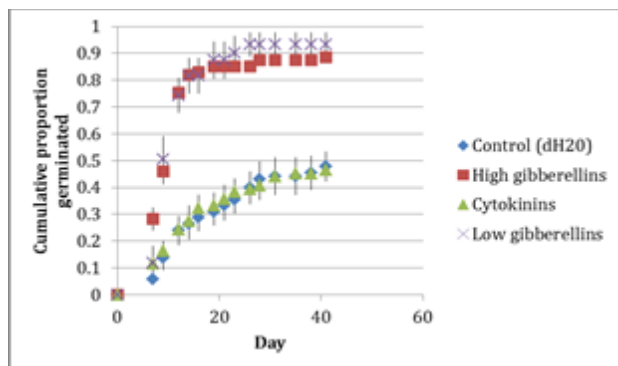


Figure 2. Average cumulative proportion germination of non-fungal *Linum rigidum* seeds over the first 41 days following an overnight soaking in one of 4 treatments: distilled water (control), 1000 mg L⁻¹ gibberellins (high gibberellins), 100 mg L⁻¹ gibberellins (low gibberellins), or 215 mg L⁻¹ of kinetin (cytokinin). Averages (± 1 SE) were calculated across 8 replicate Petri dishes per treatment.

Conclusions

Seed germination occurred at similar rates for both cold stratification periods, and in the control (not stratified), suggesting that this is not a useful technique for breaking physiological seed dormancy in *L. rigidum*. This finding appears similar to Clothier's (2013) report that germination occurs slowly and sporadically in other *Linum* species following stratification. Germination rates were not statistically significant for either surface-sterilized or not surface-sterilized seeds, suggesting that this technique does not promote germination in *L. rigidum*. In contrast, application of gibberellic acids did dramatically increase germination rates,

suggesting that *L. rigidum* exhibits physiological dormancy.

Acknowledgements

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Does Loss of Sterol-Sensing Domain Transmembrane Segments Alter the Trc8 Protein's Growth Inhibitory Effects in HEK293 Cells?

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Abstract – *TRC8*, a tumor-suppressor gene candidate, encodes a predicted multi-pass transmembrane protein. The first five transmembrane segments bear strong resemblance to the sterol-sensing domain of HMG-CoA Reductase and related proteins. Our previous work, and the work of others, has shown that the Trc8 protein does demonstrate cholesterol dependent stability and plays a regulatory role in cholesterol homeostasis. For this project, we generated stably transfected, inducible HEK-293 cell lines to express deletion mutant Trc8 proteins missing tandem pairs of transmembrane segments. This study aims to determine if the deletion of the transmembrane segments has an effect on the protein's ability to suppress cell proliferation.

Keywords – cholesterol, tumor-suppressor, mutation, *TRC8*, sterol-sensing domain

Introduction

TRC8 (translocated in renal carcinoma on chromosome 8) was first identified as a gene interrupted in a reciprocal translocation segregating in a family with classic hereditary renal clear-cell carcinoma (RCC). (Gemmill, et al., 1998) Sequence analysis suggested that the Trc8 protein has 10-12 membrane-spanning segments, the first five of which have significant sequence similarity with the sterol-sensing domains (SSD) of the *Drosophila* Hedgehog receptor, Patched, and with human 3-hydroxy-3-methylglutaryl coenzyme-A reductase (HMGCR). (Gemmill, et al., 1998) Near the C-terminus there is a RING H2 domain which has been shown to have ubiquitin ligase activity. (Gemmill, et al., 2002) Overexpression of Trc8 in tissue culture and in the nude mouse tumor model results in RING-dependent growth suppression which suggests that *TRC8* functions as a tumor-suppressor gene. (Brauweiler, et al., 2007)

In order to understand how loss of Trc8 may lead to tumor formation, it was necessary to understand the conditions under which the endogenous protein might be active. We have shown that the wild-type Trc8 protein demonstrates sterol-dependent stability in a manner similar to HMGCR. (Lee, et al., 2010) This observation led to the investigation of the effects of Trc8 on the overall mechanism of cholesterol

homeostasis involving the proteins insulin induced gene (Insig), sterol response element binding protein (SREBP), and SREBP cleavage activating protein (SCAP). (Goldstein, et al., 2006) It was discovered that the Trc8 protein interacts with the known SSD binding protein, Insig-1. (Lee, et al., 2010) Furthermore, overexpression of Trc8 results in a RING-dependent decrease in SREBP1 and SREBP2, while siRNA-mediated knockdown of endogenous Trc8 results in increased levels of SREBP2. (Lee, et al., 2010) Additionally, these results have been corroborated and extended by others to show that Trc8 is also involved in the ubiquitin-mediated degradation of HMGCR. (Jo, et al., 2011)

Preliminary results have demonstrated that the SSD deletion proteins are expressed at levels lower than their wild-type and RING mutant counterparts. This project focuses on determining if the alteration in stability also affects the ability of the mutant proteins to inhibit growth. If the deletion mutants are functional in terms of growth suppression, this would support a model in which the modified protein is properly folded and appropriately localized within the cell. If that is the case, studies will continue into the stability of the deletion mutant proteins to determine if the deleted segments play a role in the sterol dependent stability. On the other hand, if the mutants fail to have an effect on cell proliferation despite having a wild-type RING domain, this would suggest the mutant protein is not functioning and therefore would be a poor candidate for future studies.

Experimental Design

Deletion mutant Trc8 expression constructs were generated previously using the Quickchange II site-directed mutagenesis kit (Agilent Technologies) with a wild-type pcDNA5 FRT/TO + *TRC8*-HA plasmid as template. These plasmid DNAs were used to generate stably transfected inducible cell lines using the HEK-293 T-rex parental cell line (Invitrogen). Upon transfection, a recombination event catalyzed by Flp recombinase

ensures a single insertion event into a transcriptionally active region of the host cell genome. This avoids the problem of clonal variation. Rapid induction of transgenes can be achieved by adding doxycycline to the media in a dose-responsive manner.

The transgenes express the wild-type (WT) protein or a deletion mutant protein. The mutations are denoted as follows: D 50 (lacking the 2nd and 3rd transmembrane segments), D 153 (lacking the 5th and 6th transmembrane segments), D 389 (lacking the 8th and 9th transmembrane segments), and D RH2 (lacking the RING H2 domain).

Growth suppressive effects were measured using a spectrophotometric cell viability assay. Subconfluent cells were seeded in a 96-well plate in complete media and incubated overnight to allow for adhesion. Expression of transgenes was induced by the addition of variable amounts of doxycycline for 45 hours (see Figure 1). Media was removed and replaced with complete media with 0.5mg/mL thiazolyl blue tetrazolium bromide (Sigma) for 2 hours allowing the substrate to be converted to precipitate by live cells. Media/substrate was removed by aspiration and the precipitate was dissolved with DMSO. The amount of precipitate produced by the living cells was measured using a Thermo Scientific Multiskan® EX plate reader at a wavelength of 540nm.

Preliminary Results

As indicated in Figure 1, the first trial indicates that the D 50 mutant protein inhibits proliferation to the same extent as the wild-type protein. The D 389 mutant protein, like the RING deletion mutant, has a minimal effect on proliferation. The D 153 mutant protein appears to be able to demonstrate only partial inhibition of proliferation. Studies being conducted currently will either support or refute the validity of these results.

Subconfluent (~40%) cells were subjected to the indicated concentration of doxycycline for 45 hours to induce Trc8 expression. Media was then removed and replaced with complete media containing 0.5mg/mL thiazolyl blue tetrazolium bromide. Cells were returned to the incubator for 2 hours. Media was then removed and precipitate was solubilized using 100µL DMSO. Absorbance was measured and used to determine cell density of induced cells relative to uninduced.

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Figures

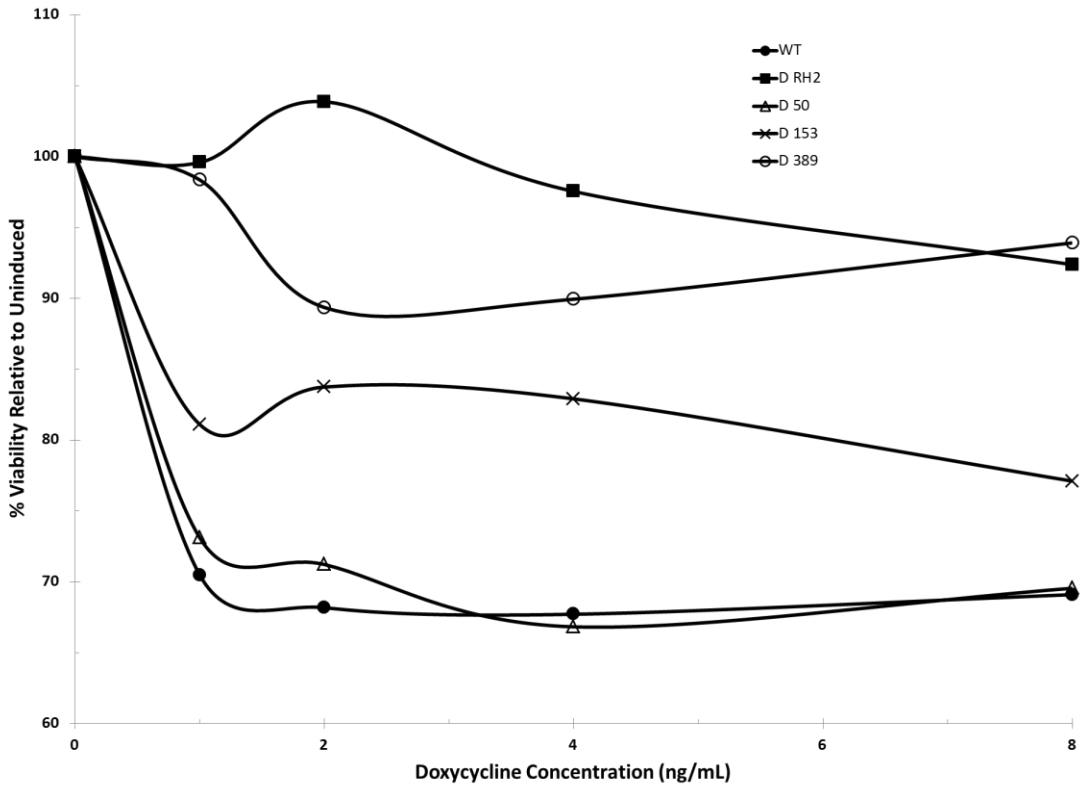


FIGURE 1. INHIBITION OF PROLIFERATION BY DELETION MUTANT PROTEINS.

Comparative Study of the Effects of Sweeteners on the Blood Glucose Level and Weight of *Rattus norvegicus*

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Abstract – High fructose corn syrup (HFCS-55) is a common artificial sweetener in American diets, and consumers are concerned about the health risks it may pose. The objective of this study was to observe the effects different sweeteners have on the weight and blood glucose levels of female Wistar rats, and to explore which would be a better substitute for HFCS-55 in their diet. Twenty rats were randomly assigned into four equal groups to drink deionized water with either no added sweetener (control group) or sweetened with HFCS-55 (13% w/v), Slimtevia (6.5% w/v), or Splenda (4.3% w/v). Their access to liquid was unlimited, and liquid consumption was recorded daily. The weight of each rat was measured weekly and the blood glucose levels were recorded every three days for sixteen weeks. Although compared to the control group, the rats given sweetened water consumed more liquid but less food, the differences in the weight gain and the blood glucose levels were insignificant. The data collected over the course of the experiment is inconclusive, showing neither Slimtevia nor Splenda to have a significant effect on the weight gain and blood glucose levels of rats. Therefore, neither can be concluded a better substitute for HFCS-55.

Keywords – high fructose corn syrup, Wistar rats, blood glucose, sucralose, stevia

Introduction

A current concern in America is obesity and the high health risk that accompanies it. In 2011, South Carolina was considered among the top twelve most obese states, with 30.8 percent of the population being obese. The average American consumes approximately 25 kg of high fructose corn syrup (HFCS-55) per year (Goran 2012). HFCS-55 is an artificial sweetener commonly used in consumer foods because it is more economical than table sugar. Studies support the idea that HFCS-55 is the cause of rising diabetes and obesity levels in America (Bray 2004). Adolescents and adults alike are looking for ways to substitute such a weight affecting substance with one that is just as sweet but lacks the negative effects. Among these proposed substitutes are Slimtevia, a new natural sweetener, and Splenda, a sucralose-based artificial sweetener (Splenda 2013).

HFCS-55 contains 55% fructose and 45% glucose, and has 16 calories per teaspoon (Koelemay 2014). Slimtevia is derived from the

Stevia rebaudiana plant, and contains small amounts of fructose to enhance its sweetness. It has 4.8 calories per teaspoon (Healthy 2011). Splenda is an artificial sweetener composed of sucralose, which is made from chlorinated sugar, dextrose, and maltodextrin. It contains approximately 2 calories in a teaspoon (Splenda 2013).

In this study, the effects of Slimtevia, Splenda and HFCS-55 on the weight gain and blood glucose levels in Wistar rats have been compared. It was hypothesized that if the type of sweetener is related to the overall health of rats, then between Slimtevia and Splenda, Splenda, the noncaloric sweetener, will be a preferred substitute for high fructose corn syrup because it will not raise weight and blood glucose levels as much as Slimtevia will.

Materials and Methods

Female Wistar rats (*Rattus norvegicus*), 3 weeks old, were obtained from Charles River Laboratories. The animals were housed singly in a 20-compartment portable metal cage and allowed to acclimatize for 1 week in a controlled environment (temperature at 21-22 °C, humidity at 55-60%, 12 hr. light: 12 hr. dark cycle, lights on at 6 AM, lights off at 6), and unlimited access to Lab Diet 5001 and water.

The animals were randomly assigned into 4 groups of 5 individuals and the initial weight of each animal was recorded at 4 weeks of age. The control group was given deionized water with no sweetener added. All other groups were given deionized water sweetened with either HFCS-55 (13% w/v), Slimtevia (6.5% w/v), or Splenda (4.3% w/v). All liquids were given *ad libitum*, and the amount of liquid consumed was recorded daily. The animals were weighed weekly and the weight gain was calculated.

Initially, the rats were given approximately 150 grams of Lab Diet 5001 every 3-day collection period. A pre-weighed aluminum foil sheet to collect food crumbs lined the bottom of each cage. In the morning of the collection period, the left over food was removed and weighed. Later that afternoon, the blood glucose level of each rat was measured using a blood glucose meter. The collection pans at the bottom of the cages were

replaced and fresh food and liquids were replenished. The total food consumption was determined by subtracting the mass of the left over food plus the food crumbs from the mass of the initial food. The experiment was conducted for a period of 16 weeks from April 15 to August 16, 2013.

Results and Discussion

For the first eight weeks, a significant difference in the amount of solid food consumed by the rats was observed in all experimental groups compared to the control group (Weeks 1-8: HFCS-55 ($t(8) = 4.27, p = .003$), Slimtevia ($t(8) = 5.26, p = .001$), and Splenda ($t(8) = 4.55, p = .002$). Weeks 9 - 16: HFCS-55 ($t(8) = 7.90, p < .001$), Slimtevia ($t(8) = 6.78, p < .001$), and Splenda ($t(8) = 4.74, p = .001$). A significant difference in the amount of liquid consumed was also observed between the HFCS-55 group ($t(8) = 4.54, p = .002$), Slimtevia group ($t(8) = 8.43, p < .001$), and Splenda group ($t(8) = 2.49, p = .037$) relative to the control group). On weeks 9 - 16, there was a significant difference in the amount of liquid consumed in the HFCS-55 group ($t(8) = 5.46, p < .001$) and Slimtevia group ($t(8) = 7.12, p < .001$) relative to the control group, but no significant difference was observed in the Splenda group ($t(8) = 1.77, p = .114$) relative to the control group.

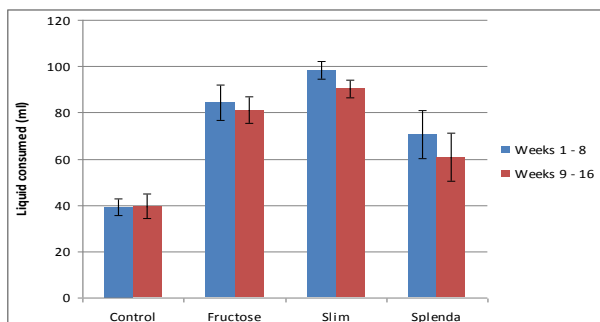


Fig. 1. Average Liquid Consumption Over a Period of 16 weeks.

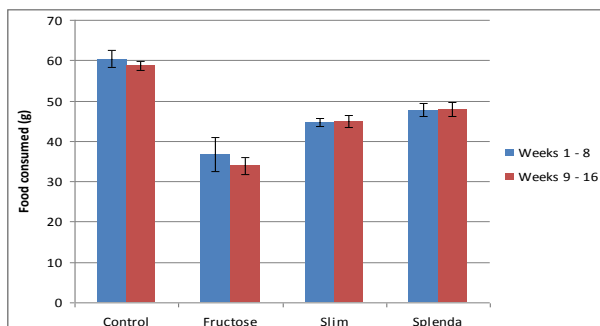


Fig. 2. Average Food Consumption Over a Period of 16 weeks.

As shown in Figure 3, there was no significant difference in the amount of weight gained between the three groups relative to the control group for all sixteen weeks (Weeks 1-8: HFCS-55 ($t(8) = 0.47, p = .755$), Slimtevia ($t(8) = 0.49, p = .729$), and Splenda ($t(8) = 0.32, p = 1.063$); Weeks 9 - 16: HFCS-55 ($t(8) = 0.04, p = .967$), Slimtevia ($t(8) = 0.25, p = .811$), and Splenda ($t(8) = 0.62, p = .554$).

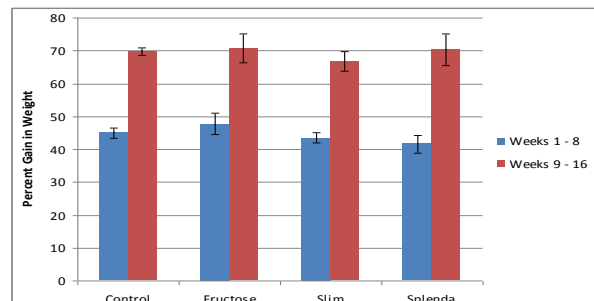


Fig. 3. Average Percent Weight Gain Over a Period of 16 weeks.

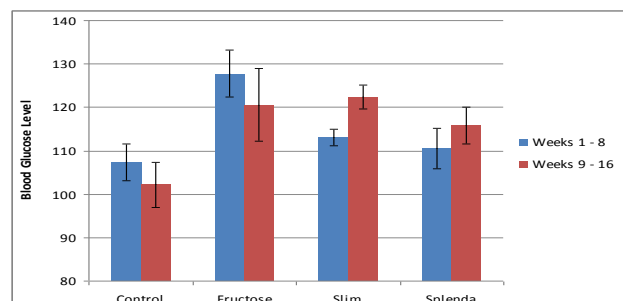


Fig. 4. Average Blood Glucose Level Over a Period of 16 weeks.

For the first eight weeks there was a significant difference in the blood glucose level between the HFCS-55 group ($t(8) = 2.934, p = .019$) relative to the control group, but no significant differences were observed in the Slimtevia group ($t(8) = 1.17, p = .276$), and Splenda group ($t(8) = 0.51, p = .625$) relative to the control group. For weeks 9 - 16, there was a significant difference in blood glucose level between the Slimtevia group ($t(8) = 3.16, p = .013$) relative to the control group, but no significant differences were observed in the High Fructose Corn Syrup group ($t(8) = 1.82, p = .107$) nor the Splenda group ($t(8) = 2.02, p = .078$) relative to the control group (Fig. 4).

The food consumption of each rat was measured to be certain that consumption was relatively similar between groups, but it was found that the difference in the food consumption between the groups was related to the consumption of sweeteners. It appears that the decrease in consumption of solid food of the experimental groups is compensated by the increased caloric intake from the sweetened liquids. Similarly, Light

et al. (2009) reported that female Sprague-Dawley rats given deionized water sweetened with HFCS-55 for 8 weeks also reduced their consumption of solid food. In contrast, however, they reported that the rats that consumed HFCS-55 had greater final body weights and fat mass compared to the rats drinking only deionized water or glucose solution. Our results showed no significant difference in weight gain between the HFCS-55 group compared to the control (Fig. 4).

Interestingly, the Splenda group ate less and consumed more liquid than the control group, yet there was no significant difference between their weights compared to the control group (Fig. 4). Since Splenda is a noncaloric artificial sweetener, we would expect the least amount of weight gain in this group but this was not the case. This shows that the rat uses a “mechanism” to compensate for the less calories consumed in order to grow normally.

The blood glucose levels varied considerably in all groups (Fig. 5) regardless of the amount or type of liquid they consumed. Therefore, one particular sweetener cannot be identified as a healthier substitute to HFCS-55. Other studies found significant disparity in the blood glucose of Wistar rats as well (Braslasu et al. 2007). It was suggested that several factors such as stress levels, time, and amount of food consumed affect the blood glucose levels of rats.

Conclusions

The data collected over the course of the experiment is inconclusive, showing neither Slimtevia nor Splenda to have a significant effect on the weight and blood glucose levels of rats. Therefore, neither can be concluded a better substitute for HFCS-55. In order to retrieve better results, in future experiments we should find a way to provide a known, fixed amount of food and liquid for the rats, and also try using a blood glucose meter specifically calibrated for rats. Increasing the sample size for each group and increasing the duration of the experiment may also aid us in acquiring more accurate results as well. Another option would be to accelerate the experiment by giving the rats twice the amount of sweetener than we gave them.

Acknowledgements

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Diseases Affecting Synthesis and Ligand Binding to Hemoglobin

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Abstract – Hemoglobin (Hb) carries oxygen from the lungs to the peripheral tissues and is regulated by various endogenous effectors that can be affected by different diseases. Therefore, the purpose of this study is to determine the optimal condition for Hb crystal formation in the presence and absence of ligands and substrate analogues. The hanging-drop vapor-diffusion method was used to crystallize the protein. Crystallization conditions were modulated by determining the best concentrations of NaCl, Polyethylene Glycol (PEG) 400-1450 (MW), and pH level. With these conditions set, crystal formation became present at 0.2M NaCl, 40% PEG 1450, and pH 5.2. However, in order to produce larger crystals, the protein concentration was modulated as well, with 60 mg/ml creating the largest crystals. Furthermore, a concentration of 5mM 2,3-bisphosphoglycerate was added to the solution creating larger crystals. Crystals will be used for X-ray diffraction, data collection, and 3-D structural studies of this macromolecule.

Introduction

Hemoglobin (Hb) is an iron-containing heterotetramer found in the red blood cells of all vertebrates. One of its major functions is to carry oxygen from the lungs to the tissues of the rest of the body (Maton 1993). Mutations in the structure of Hb and its biochemical properties can produce severe physiological side effects. More than 1000 naturally occurring human Hb variants with single amino acid substitutions throughout the molecule have been discovered, mainly through their clinical and laboratory manifestations¹. Because this function of Hb is regulated by various endogenous effectors and can be affected by different diseases, it is necessary to study the structure of Hb and its biochemical properties.

Experimental Methods and Results

This research was conducted with dialyzed and lyophilized bovine blood hemoglobin from Sigma. This study allows one to become familiar with the different techniques involved in crystallizing hemoglobin in the presence and absence of ligand by determining the optimal solution for crystal formation. Hanging-drop vapor-diffusion method was used to crystallize the protein. A drop of containing 3 μ l Hb solution was equilibrated against 1 ml of reservoir solution containing 40%

PEG 3350 (Polyethylene glycol) in a 100 mM phosphate buffer of pH 6.7 with 1M NaCl. These conditions allowed us to have a base line to adjust the crystallization parameters needed to create the optimal solution. Thus, the results were inconclusive, producing precipitates with no crystals.

Optimizing the crystallization conditions started by determining the best concentrations of NaCl in the presence of PEGs 400-1450 (MW) with different concentrations. The optimal concentrations were determined to be 0.2M NaCl and 40% PEG 1450. One of the most important factors involved in crystal formation is the pH level. After testing pH's ranging from 4.0-7.4, 5.2 was considered to be the optimal pH. With these conditions set, crystal formation became present. However, in order to produce larger crystals, the protein concentration was modulated. Protein solutions with concentrations ranging from 10-60 mg/ml were used, with 60 mg/ml being the best. Furthermore, the additive glycerol (2,3-bisphosphoglycerate) was added to the protein solution to see whether it had an effect on crystal growth. A concentration of 5 mM of glycerol produced results. These modulations were able to bring the supersaturation of the solution back into the nucleation zone, where the crystals were able to grow.

Conclusions

Crystallization conditions were successfully optimized through the modulation of pH, precipitant concentration, protein concentration, and ligand. However, these procedures can be modified and more substrates and substrate analogues can be used to obtain complex crystals for X-ray diffraction, data collection and 3-D structure determination, which will allow us to have a better understanding of the folding and structural changes of hemoglobin in the presence of ligands.

Acknowledgements

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Influence of pH on the Removal of Chromium Species Using Lysine Functionalized Magnetic Iron Nanoparticles

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Abstract- Magnetic iron nanoparticles (Fe_3O_4) were synthesized using co-precipitation method with aqueous Fe^{+2} and Fe^{+3} under alkaline conditions. Lysine was immobilized onto the surface of the magnetic iron nanoparticles (MNPs) and the particles were characterized using Fourier transform infrared (FTIR) spectroscopy and thermogravimetric analysis (TGA). The removal of chromium species from water using the lysine functionalized magnetic iron nanoparticles (L-MNPs) was investigated at Cr(VI) and Cr(III) concentrations ranging from 0-100 ppm, and varying pH values (3.0, 4.0, and 6.0). The sorption of Cr(VI) onto L-MNPs reached equilibrium in less than 90 min. Chromium removal capacity with L-MNPs was pH and chromium species dependent. The L-MNPs removed 70 mg Cr(VI) per gram and 1 mg Cr(III) per gram at 100 ppm Cr for pH 3.0 and 4.0 respectively. The L-MNPs have potentials for selective solid phase speciation and preconcentration of Cr(VI) species.

Keywords – Iron Nanoparticles, Lysine, Chromium, Removal, Speciation

Introduction

Magnetic iron nanoparticles (MNPs) have attracted much attention due to their wide applications in fields such as wastewater treatment and targeted drug delivery [1]. Recently, low-cost MNPs were used for the removal of two metallic pollutants (copper and chromium) from aqueous solutions and industrial effluents. These particles have shown unique characteristics, such as large surface area, and high reactivity that make them more efficient adsorbents than conventional materials [2].

Most applications require MNPs to be chemically inert, well dispersed, and uniform in size. An effective approach to achieve this is by coating the MNPs with multifunctional polymers or biomolecules. The functional groups on these coatings can be used to bind or remove materials such as organics and metals from solution. Magnetic iron nanoparticles have been coated with lysine, a multifunctional amino acid [3,5]. The lysine coated MNPs (L-MNPs) were stable in physiological fluids for over three months [3] and the proposed mechanism of the binding was unidentate coordination between the carboxyl groups of lysine and the metal ion [5].

Chromium is frequently found in soil and aquatic environments due to its widespread use in many industrial processes. It can exist in many oxidation states; however the most stable chromium species in the environment are Cr(III) and Cr(VI) [4]. In biological systems, Cr(III) is considered a necessary micronutrient in normal carbohydrate and lipid metabolism as opposed to Cr(VI), which is highly toxic[4]. Due to the high toxicity of Cr(VI) it is important that an inexpensive and efficient adsorbent is developed for its preconcentration and removal from water. In this study, a magnetic adsorbent was synthesized and characterized by Fourier transform infrared (FTIR) spectroscopy and thermogravimetric analysis (TGA). The sorption kinetics and capacity of the L-MNPs for chromium species were evaluated under varying experimental conditions.

Experimental Methods

Reagents and Chemicals

All the chemicals used in this study were of reagent grade. Ultrapure water from Millipore water system was used in this study.

Synthesis of MNPs

Concentrated 12 M HCl (0.6 ml) was added to ultrapure water (200 ml) in a round bottom flask, and purged under nitrogen for 30 min. $FeCl_3 \cdot 6H_2O$ (11.12 g) was added and allowed to mix for 10 minutes followed by the addition of $FeCl_2 \cdot 4H_2O$ (4.96 g). The reaction mixture was purged under nitrogen and stirred vigorously for the duration of the synthesis. The solution was then heated to 70°C and 14.8 M NH_4OH (20 ml) was added. The black precipitates (MNPs) formed were aged for 1 hour at 80°C. The MNPs were washed five times with ultrapure water using magnetization-redispersion. A small amount of MNPs were dried overnight under vacuum at 80°C for TGA and FT-IR analysis. The remaining wet MNPs were stored in a 20 ml glass scintillation vial.

Synthesis of L-MNPs

Concentrated 12 M HCl (0.6 ml) was added to ultrapure water (200 ml) in a round bottom flask,

and nitrogen purged for 30 min. $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ (33.33 g) was added and allowed to mix for 10 minutes followed by the addition of $\text{FeCl}_2 \cdot 4\text{H}_2\text{O}$ (14.80 g). The reaction mixture was purged under nitrogen gas and stirred vigorously for the duration of the synthesis. The solution was then heated to 70°C and 14.8 M NH_4OH (120 ml) was added producing black precipitates (MNPs). After approximately 5 minutes a 0.50 M solution of lysine (180 ml) was added. The L-MNPs were aged for 1 hour at 80°C and were washed five times with ultrapure water using magnetization-redispersion. A small amount of the L-MNPs were dried overnight under vacuum at 80°C for TGA and FT-IR analysis. The remaining wet L-MNPs were stored in 20 ml glass scintillation vials for later use.

Kinetics of Cr(VI) Removal

Approximately 0.0275 g (wet weight) of L-MNPs were added to 50 ml reaction vials. Duplicates of pH 3.0, 40 ppm Cr(VI) were added and shaken in a rotary shaker for 30, 60, 90, 120, 150, and 180 minutes. The L-MNPs were separated from the supernatant using a magnet. The concentration of chromium removed was determined from the initial and final concentration by Flame Atomic Absorption Spectroscopy (FAAS).

pH Dependent Removal of Cr Species

Stock Cr(III) and Cr(VI) solutions were made at pH 3.0, 4.0 and 6.0 at concentrations of 10, 20, 40, 80, and 100 ppm Cr. Cr(III) precipitated out of solution at higher pH so pH 6.0 was not made. Approximately 0.0275 g of L-MNPs were added to 50 ml reaction tubes. 50 ml of each respective concentration and pH were added to each tube and shaken in a rotary shaker for 90 minutes. The L-MNPs were separated from the supernatant using a magnet. The samples were prepared in duplicates. Chromium concentration in the supernatant was quantified by FAAS.

Nanoparticles Characterization and Chromium Concentration Determination

The infrared spectra were acquired using a Nicolet iS50 FT-IR spectrometer. The Thermogravimetric analysis was performed using a High-Res TGA 2950 Thermogravimetric Analyzer. The measurement of chromium concentration was conducted using a Perkin Elmer Atomic Absorption Spectrometer 3100.

Results and Discussion

Kinetics and pH Dependent Removal of Cr Species

The removal of chromium species from water was conducted at different pH values and varying initial chromium concentrations. Figure 1 shows the effect of contact time on chromium adsorption.

The results (Fig. 1) show that after approximately 90 minutes there was no further significant adsorption of Cr(VI) onto the L-MNPs, therefore 90 minutes was selected for the optimal reaction time.

The calculated maximum adsorption capacities (Q_e) of L-MNPs for Cr(III) and Cr(VI) are presented in Figure 2. The L-MNPs removed more Cr(VI) than Cr(III) at all initial concentrations of chromium (0-100 mg/L) and pH range of 3-6. The Q_e values increased with increasing concentration of Cr for both species. The Cr(VI) had the highest adsorption, which was attributed to the positively charged amino group being electrostatically attracted to the negatively charged dichromate complex ($[\text{Cr}_2\text{O}_7]^{-2}$). The decrease in the adsorption behavior of Cr(III) can be attributed to the repulsion between the positively charged Cr(III) ions and the positively charged amino group on the lysine at acidic pH.

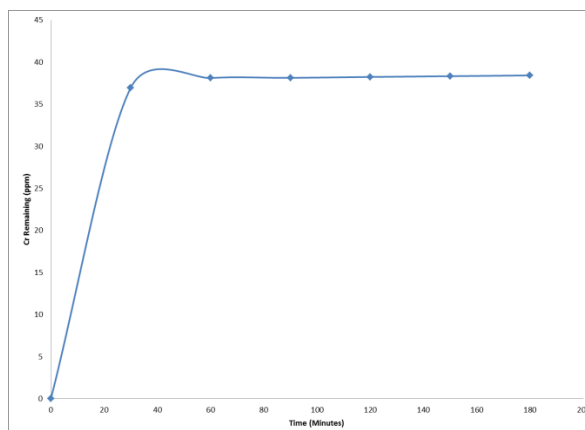


Fig. 1 Concentration of pH 3.0 Cr(VI) adsorbed vs. time

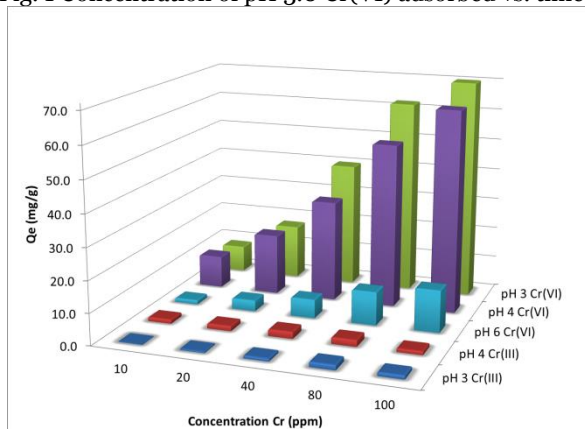


Fig. 2 Q_e values of Cr(VI) and Cr(III) at pH of 3.0, 4.0, and 6.0

Conclusion

In conclusion, both MNPs and L-MNPs were successfully characterized using TGA and FT-IR analysis. The max reaction time for the adsorption

of Cr(VI) was less than 90 minutes based on the kinetic study. The removal study indicated that L-MNPs removed more Cr(VI) per gram than the Cr(III), with a max adsorption of 70 mg Cr(VI) (pH 3.0, 100 ppm Cr(VI)) and 1 mg Cr(III) (pH 3.0, 100 ppm Cr(III)). This shows that L-MNPs have the potential for selective chromium speciation removal. Further studies will include the desorption of Cr(VI) from the L-MNPs and evaluation of the adsorption capacity of L-MNPs in a mixture of chromium species (III, VI).

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Synthesis of Two Dimensionally and One Dimensionally Confined Cadmium Selenide Nanocrystals

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Abstract – We report the synthesis of two dimensionally and one dimensionally confined cadmium selenide nanocrystals based on using a simple fatty acid precursor. The synthesis strategy involves carefully controlling the temperature of the nucleation and growth of the nanocrystals, and keeping the temperature well below the 300 °C that is traditionally used in the pyrolytic synthesis of nanocrystals. Our method provides a facile route to synthesize nanocrystals with several different morphologies.

Introduction

Semiconductor nanocrystals have been a popular area of research because of their unique optical properties which are a result of the quantum confinement of photo-generated electron-hole pair. (Sandra J. Rosenthal, 2007) Among the most commonly synthesized semiconductor nanocrystals have been those in which the electron-hole pair are confined in all three spatial dimensions. (C. B. Murray, 1993) The optical properties of these materials have been applied to the development of nanocrystal based solar cells (Istvan Robel, 2006) as well as light emitting diodes. (Seth Coe, 2002) Recently, research has been focused on efforts to synthesize semiconductor nano-materials which are not confined in all three dimensions. (Sandrine Ithurria, 2008; Wei Wang, 2007)

By synthesizing materials in which the photo-generated electron-hole pair is only confined in one or two spatial dimensions we can obtain new morphologies, such as sheets and wires. Many of the strategies developed thus far have centered on using specific ligands to control the direction of growth in the nano-material, while maintaining the high temperatures (300 °C or higher) typically employed in the synthesis of three dimensionally confined nanocrystals. (Wei Wang, 2007) In this work, we develop a synthetic strategy which is based on careful control of the temperature of the reaction at nucleation and during the growth process.

Experimental

Synthesis of Two Dimensionally Confined Nanocrystals

Our synthesis strategy is a modification of the fatty acid synthesis that has been widely employed to yield cadmium selenide nanocrystals which have a dot morphology. (W. William Yu, 2002) For the synthesis of two dimensionally confined nanocrystals, 10 mL of 1-octadecene, 128.8 mg of CdO, and 1.3 mL of oleic acid are combined in a three neck flask which is fitted with a bump trap, a temperature probe, and a rubber septum. A purge needle is inserted into the rubber septum and the reaction vessel is purged with argon while the reactants are heated to 120 °C. The purge needle is then removed and the reaction mixture is further heated to a temperature of 310 °C under an argon atmosphere. Once the CdO has completely reacted with the oleic acid, the reaction mixture becomes clear and colorless. At this point the temperature of the cadmium oleate solution is lowered to 250 °C, and 10 mL of a 0.1M selenium solution is injected, which begins the nucleation and growth of the nanocrystals. The 0.1M selenium solution is prepared by first dissolving 31.59 g of selenium metal in 100 mL of tri-n-butyl phosphine, resulting in a 4M selenium solution. This 4 M selenium solution is then diluted to 0.1 M with 1-octadecene. Growth of the nanocrystals was carried out at 250 °C and the progress of the reaction is monitored by taking aliquots and measuring the band edge absorption using UV-Vis spectroscopy. When the nanocrystals reached the desired size, the reaction was halted with an injection of 20 mL of butanol, followed by cooling the reaction flask with compressed air until the temperature of the nanocrystal solution fell below 100 °C.

Synthesis of One Dimensionally Confined Nanocrystals

In a three neck flask, 1mmol of cadmium acetate, 10 mL of 1-octadecene, and 2 mmol of 2-trans decenoic acid are combined. The flask is fitted with a bump trap, a temperature probe, and a rubber septum. The flask is purged with argon and heated to 120 °C, and then the purge needle is removed. The temperature is increased to 140 °C and 10 mL of 0.1M selenium solution is injected (preparation described above). The growth of the nanocrystals is monitored by UV-Vis absorption

spectroscopy, and the reaction is halted with an injection of butanol once the desired size is achieved, followed by further cooling with compressed air until the temperature is below 100 °C.

After the synthesis, the nanocrystals were cleaned and isolated via precipitation and centrifugation. The nanocrystals were precipitated by adding a butanol/ethanol solution (50%_{v/v} butanol), until the nanocrystals precipitated. The nanocrystals were collected by centrifugation. After centrifugation, the supernatant is decanted and discarded; the remaining pellet of nanocrystals is dispersed in chloroform and then precipitated by the addition of acetone. The nanocrystals are again collected by centrifugation. The supernatant is discarded. The chloroform/acetone washing step and centrifugation is repeated a second time, and after completion, the nanocrystals are dispersed in hexanes. Samples are stored in the dark until they are analyzed by electron microscopy in order to prevent photo-oxidation.

Results and Discussion

The result of the low temperature fatty acid synthesis is shown in Figure 1A. The resulting nanocrystals do not have the dot morphology that would be expected with the fatty acid synthesis. Instead, the predominant morphology is a bi-pod, with some more highly branched structures occasionally observed. The difference between our synthetic method and that of Yu is the temperature of the cadmium precursor at the time that the selenium injection. At the lower temperature, the surface ligand should bind more tightly to the Cd atom, as there is less thermal energy available to cause dissociation of the cadmium oleate. We propose that it is this tighter binding of the surface ligand that is responsible for blocking growth on only certain facets of the nanocrystal.

We investigated different carboxylic acids to determine if this result is unique to oleic acid, or if it is present at low temperatures in many different carboxylic acid ligands. Hexanoic acid was used, but the nanocrystals precipitated and could not be dissolved during the clean-up process. In addition, 2-trans decenoic acid was tested with CdO in an effort to generate a reactive cadmium precursor. This acid failed to convert the CdO into a reactive species below the ligand's boiling point; as a result we switched to the more reactive cadmium acetate as the cadmium source for the 2-trans decenoic acid.

Unlike the CdO/fatty acid synthesis, the cadmium acetate/fatty acid precursor is more reactive as the 2-trans decenoic acid simply

replaces the acetate ions on the cadmium; no conversion of the cadmium is required. The result is a reactive cadmium precursor which is capable of nucleating nanocrystal growth at a much lower temperature, in this case at 140 °C. The resulting structures do not have the two dimensional confinement that was associated with the CdO/oleic acid synthesis. As is shown in Figure 1B, the resulting sheet morphology has two dimensions which are larger than the size necessary to confine the electron-hole pair (11 nm in diameter for CdSe). (C. B. Murray, 1993) The resulting structure opens the possibility that these semiconductor sheets could be used in prototypical devices in the future, as they still confine the photo-generated electron-hole pair in one dimension, while allowing for the construction of larger structures.

Conclusion

We have shown that careful control over the temperature of the reaction during the nucleation and growth provides a simple and convenient manner to manipulate the morphology of the resulting semiconductor nanocrystals. By carefully controlling the temperature we are able to modify a synthetic scheme which normally results in nanocrystals with dot morphology, and synthesize nanocrystals which are bi-pods or even sheets.

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Figures

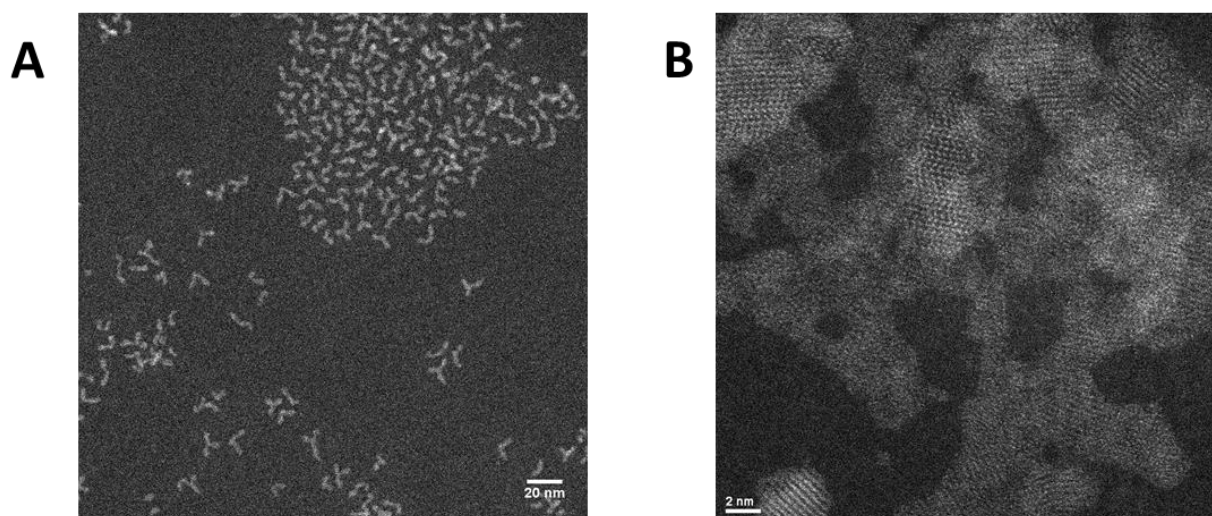


Figure 2. (A) Nanocrystals synthesized using a fatty acid precursor and a low temperature injection. (B) Nanocrystals synthesized with trans 2-decaonic acid and cadmium acetate are shown.

Stereotypes about Higher Level of Education

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Abstract — *Stereotypes have been around since the beginning of time. There are stereotypes about anything and everything that you can think of. The purpose of this study was to examine the validity of some of these stereotypes involving education level. We used a dataset from the National Health and Nutrition Examination Survey (NHANES) in 2011-2012 to conduct these tests. Contrary to our hypotheses, we found that each of the stereotypes examined were justified. There are, in fact, several common demographics, including gender and race, which affect education level.*

Keywords — Education level, stereotypes, NHANES

Introduction

There have always been stereotypes concerning education level. A common stereotype is that different genders, races or ethnicities tend not to achieve higher levels of education than others. For example, measuring differences in education between men and women has been a priority of development organizations and the international community for many years (Ganguli *et al.*, 2011), and academic stereotype research has frequently focused either on race differences between the achievement of whites versus that of other racial/ethnic groups or on gender differences in mathematics and science performance (Kurtz-Costes *et al.*, 2008). Meanwhile, jobs that require high levels of education and skill pay higher wages than jobs that require few skills and little education. Statistics from the U.S. Bureau of Labor Statistics validate this viewpoint by revealing that the unemployment rate among people who have a professional degree is significantly lower than that of people who have a high school diploma or less than a complete high school education. In addition, earnings tend to increase significantly as a worker's degree of education rises (Bureau of Labor Statistics).

We examined data from the National Health and Nutrition Examination Survey 2011-2012 Demographic dataset. Of the 37 variables in the dataset, we decided to focus our research on a few of them. The variables that we examined contribute to the most common stereotypes. Gender, race, and wealth are the most notorious stereotypes and as such, they were included in our data. Our interest of this study was to investigate possible differences

among education levels by these variables. We used the statistical analysis program SAS to conduct this study.

Methods

We first collected the data from the NHANES website. We could not use the 2013-2014 dataset because NHANES is still collecting and updating several of the variables, which could have caused bias in the data and produced inaccurate results. There were 37 variables included in this dataset, but we decided to remove several of these variables due to various reasons. Some of the omitted variables were missing the majority of their values. Others were simply not necessary to our study. The variables used were as follows: gender, race/ethnicity, active duty status in the US military, citizenship status, family income and education level.

The next step was to remove all of the observations for which there were missing values for some variables, or the participant had refused to answer certain questions. These observations would have skewed our data, producing results that were not as accurate as possible. There were still about 5000 observations included in our data. We created an additional variable for our data that would combine some of the possible values for education level into a more appropriate set of 3 groups: no high school diploma, high school diploma or GED, and at least some college. We also created an additional variable that would condense the numerous possible values for family income into only 4 groups: \$0-\$19,999, \$20,000-\$54,999, \$55,000-\$99,999, and \$100,000 or above. We then examined the relationships between each variable and education level.

Results

For an overall sense of the data being analyzed, we made graphical representations of data. From the bar charts, we found that there was a definite relationship present in each case. After noticing these trends, we then performed chi-squared tests to test whether these relationships were significant, or if they were simply coincidence.

In the first test, our interest was if there was difference in the proportions of males versus females in terms of each education level. Looking at the plots, there appeared to be a slightly larger proportion of females who have at least some college education than males. This difference was confirmed by a chi-squared test as well. In the second test, our interest was if there was difference in the proportions of each race (Mexican-American, other Hispanic, white, black, Asian, and other) in terms of education level. The bar charts show a significantly larger proportion of Asians with at least some college than any other race. Mexican-American was the only race that had a significantly larger proportion of people with no high school diploma than with at least some college. This indicates that Asians tends to achieve a higher education level than any other race, with Mexican-Americans typically having lower education level. In the third test, our interest was if there was difference in the proportions of those who had served active duty versus those who hadn't in terms of education level. Those that had served active duty had a slightly larger proportion of people with at least some college and a smaller proportion of people with no high school diploma than those that had not served. In the fourth test, our interest was to investigate if there was an association between US citizenship status and education level. The plots show that US citizens have a significantly larger proportion people with some college than non-US citizens and that there is significant difference in the proportions of lower education levels between the two groups. In the fifth test, our interest was if there was difference in the proportions of people from various family incomes in terms of education level. We found that as the income level increased, the proportion of people with at least some college significantly increased as well. This indicates that those with a higher income level typically tend to have a higher education level.

Table 1 shows the results of these tests. Notice that at a significance level of 0.05, each p-value is significant. This justified the conclusions.

Table 1. Summary of the test statistics and their p-values

Variables	Chi-Square (χ^2)	p-values
Gender	18.3545	0.0001
Race	486.6104	<0.0001
Service in active duty	25.5029	<0.0001
Citizenship status	182.4130	<0.0001
Family income	689.8826	<0.0001

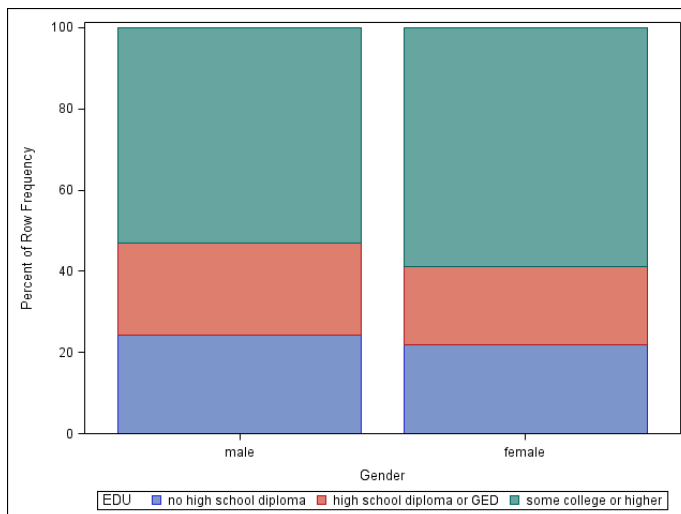


Fig 1. Distribution of education level by gender

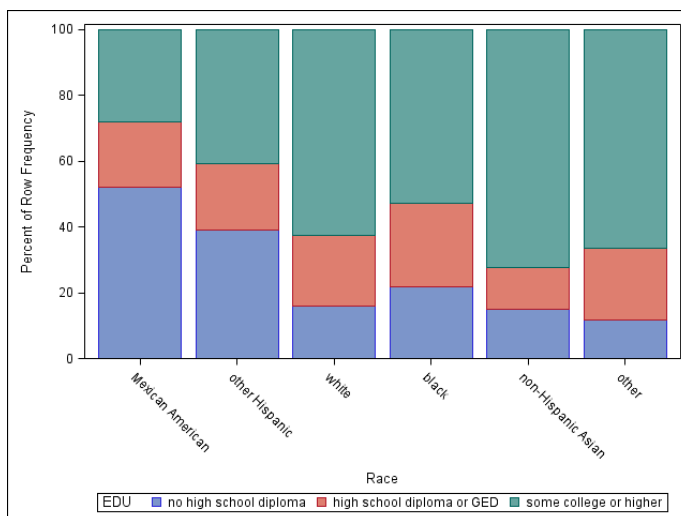


Fig 2. Distribution of education level by race

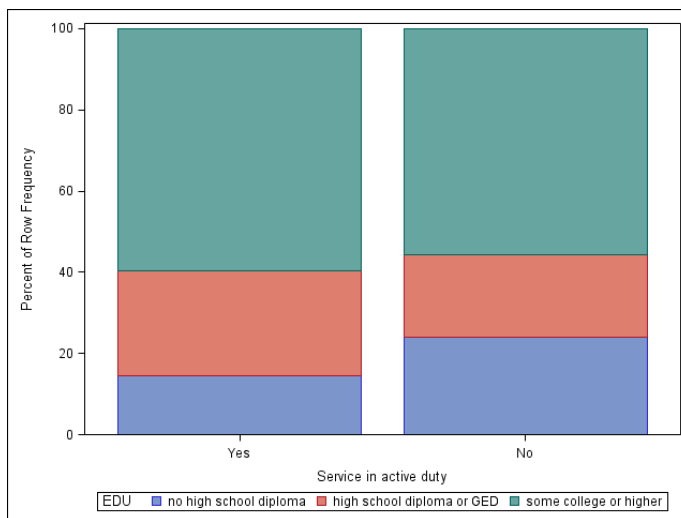


Fig 3. Distribution of education level by military service

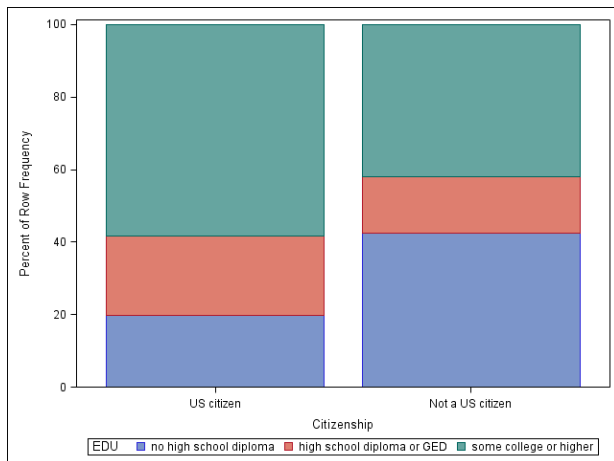


Fig 4. Distribution of education level by U.S. citizenship status

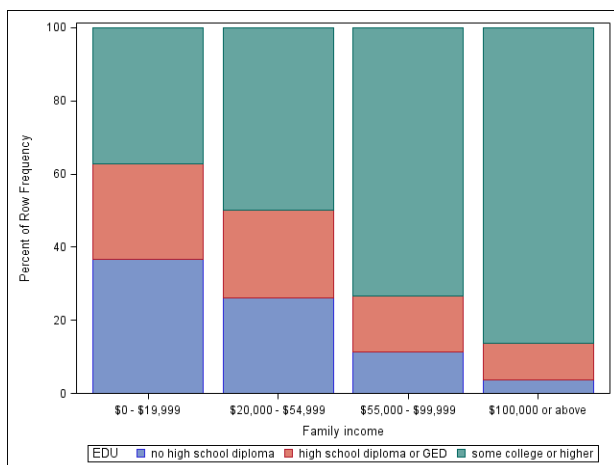


Fig 5. Distribution of education level by family income

Conclusions

According to the analysis, we are justified in the conclusion that at a significance level of 0.05, there is a significant relationship in each case. Each of the most common stereotypes examined (gender, race, U.S. citizenship, military service in duty, and family income) were shown to be significant.

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The Influence of Varying Surface Tension on Tissue Fusion

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Abstract – Boundary element method is used to study the influence of varying surface tension during the process of tissue fusion where a cellular aggregate is approximated by a very viscous liquid drops. The mathematical formulation includes the Stokes equation for the fluid velocity and the convection-diffusion equation for surfactant concentration. Our numerical results show that the varying tissue surface tension caused by non-uniform distribution of adhesion molecules will retard the fusion process.

Introduction

Bioprinting^[1] is an emerging transforming technology that can be used to manufacture organs that the human body can accept. The availability of these organs will benefit those who need organs for transplant and potentially prolong their life. This 3D printing technology will reduce the waiting lists that transplant patients are on for years. One of the key mechanisms in bioprinting is tissue fusion

during which two opposing tissue components merge into a continuous tissue. Incorrect fusion can cause various human birth defects. Mathematical and computational models are ideal tools to predict and optimize postprinting structure formation.

“Morphogenesis is under strict genetic control, but shape evolution itself is a physical process” [2]. This physical process obeys the laws of fluid dynamics. Several mathematical modeling and computational methodologies can be used such as coarse-grain Molecular Dynamics, Monte Carlo, and Kinetic Monte Carlo simulations [3]. Also, the phase field multiphase mathematical model is applied to study the biofabrication process [4]. The boundary element methods alongside the biharmonic boundary integral equation method are tools that allow for the numerical simulation of tissue fusion. The reason we will use these methods are, “the boundary integral equation method has the big advantage over finite difference and finite element methods of superior convergence and greatly reduced requirements in computer storage and programming” [5]. The mathematical equations and methods used in the boundary element method will be discussed in the next section.

Mathematical Model

Considering the time scale involved in the morphological development, a viscous fluid drop in a region Ω , whose dynamics are governed by the Stokes equations, can be used to describe a cellular aggregate. For an incompressible viscous fluid, the Stokes equation system is given by

$$\nabla p = \mu \nabla^2 u + \rho g,$$

$$\nabla \cdot u = 0,$$

where p is the pressure, μ is the viscosity, $u = \{v_t, v_n\}$ is the fluid velocity, ρ is the density (assumed constant) and g is the acceleration of gravity.

By writing the velocity in terms of streamfunction ψ ,

$$v_n = \frac{\partial \psi}{\partial t} \text{ and } v_t = -\frac{\partial \psi}{\partial n}$$

the Stokes equation can be written as the biharmonic equation, which can be solved as,

$$\eta(p)\psi(p) = \oint_{\partial\Omega} (\psi(q) \frac{\partial G_1(p,q)}{\partial n} - \frac{\partial \psi(q)}{\partial n} G_1(p,q)) dq + \frac{1}{4} \oint_{\partial\Omega} (w(q) \frac{\partial G_2(p,q)}{\partial n} - \frac{\partial w(q)}{\partial n} G_2(p,q)) dq$$

$$\eta(p)\omega(p) = \oint_{\partial\Omega} (w(q) \frac{\partial G_1(p,q)}{\partial n} - \frac{\partial w(q)}{\partial n} G_1(p,q)) dq,$$

where $q \in \partial\Omega$ and $\eta(p)$ is given by

$$\eta(p) = \begin{cases} 0, & p \notin \Omega + \partial\Omega \\ \varphi, & p \in \partial\Omega. \\ 2\pi, & p \in \Omega \end{cases}$$

The Green functions are $G_1 = \log|p - q|$ and $G_2 = |p - q|^2(\log|p - q| - 1)$ [7].

Therefore, the boundary element method [11-16] enables us to reformulate the original differential equations, which hold on the entire cellular fluid domain Ω as integral equations only along the domain boundary $\partial\Omega$. Therefore we only need to discretize the boundary rather than the entire domain.

On the free boundary $\partial\Omega$ separating Ω from the surrounding hydrogel, there are three boundary conditions: kinematic condition, tangential stress balance, and normal stress balance. The first equation is the tangential stress condition,

$$-\omega + 2 \frac{\partial^2 \psi}{\partial s^2} + 2k \frac{\partial \psi}{\partial n} = \frac{1}{\mu} \frac{\partial \sigma}{\partial t},$$

where s is the contour arc length, $k = d\phi/ds$ is the local curvature, and σ is surface tension.

The second equation is normal stress balance,

$$\frac{\partial \omega}{\partial n} + 2 \frac{\partial^2 \psi}{\partial s^2} \frac{\partial \psi}{\partial n} - 2 \frac{\partial}{\partial s} \left(k \frac{\partial \psi}{\partial s} \right) = -\frac{1}{\mu} \frac{\partial \sigma}{\partial t} k - \frac{\sigma}{\mu} \frac{\partial k}{\partial s},$$

where k is the curvature.

The third condition is the kinematic condition, which can be used to move the surface every time step by an Euler approximation,

$$x(\tau + \Delta \tau) = x(\tau) + v_x \Delta \tau, \text{ and } y(\tau + \Delta \tau) = y(\tau) + v_y \Delta \tau,$$

where τ is time and v_x and v_y are found from ω and $\partial\phi/\partial n$.

For simplicity, a linear model is used to describe the relation between surfactant concentration and tissue surface tension

$$\sigma = \sigma_0 \left(1 - \beta \frac{\Gamma}{\Gamma_0}\right),$$

where σ_0 is the surface tension of a clean surface, Γ_0 is the initial surfactant concentration, and the parameter β is the sensitivity. The evolution of concentration is governed by an advection-diffusion equation [8]

$$\frac{\partial \Gamma}{\partial t} \Big|_n + \frac{\partial}{\partial s} (u_s \Gamma) + \Gamma \kappa u_n = \frac{1}{Pe} \frac{\partial^2 \Gamma}{\partial s^2},$$

where the Peclet number $Pe = UL/D$ and the time derivative is in a fixed normal coordinate. The finite-volume method [9-10] is then used to track the evolution of the surfactant concentration on the surface.

Results

The boundary element method is used to study the process of an elliptical cellular aggregate rounding up to a circle under the influence of the surface tension. The figure (1) shows the relaxation process starting from a clean surface, i.e., constant surface tension; the figure (2) shows the process starting from a contaminated surface, i.e., the varying surface tension caused by non-uniform distribution of adhesion molecules. The figure (3) compares the ratio of major axis and minor axis in two situations where the red line indicates the dynamic of a contaminated surface and the blue line indicates the dynamics of a clean surface. From this plot, we can see that the red line take more time to reach the steady state shape, i.e., the varying surface tension retards the rounding process. Our future will focus on dynamics of fusion process, which numerically is very similar to current work.

Acknowledgements

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Figures

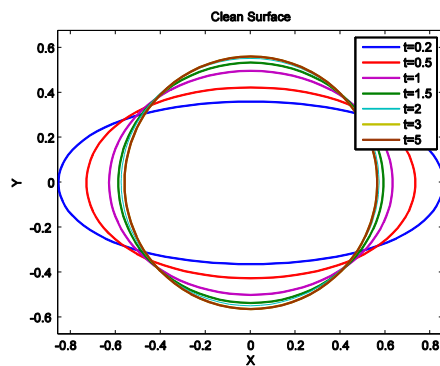


Figure 3: Evolution of a clean ellipse to a circle.

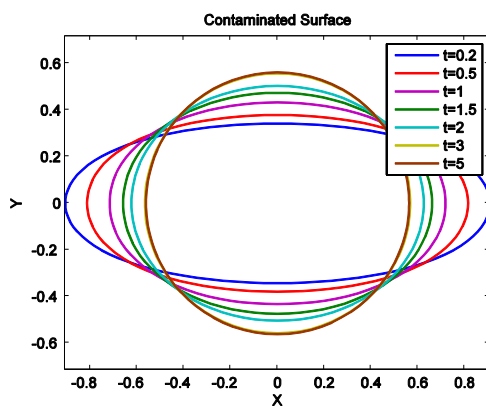


Figure 4: Evolution of a contaminated ellipse to a circle.

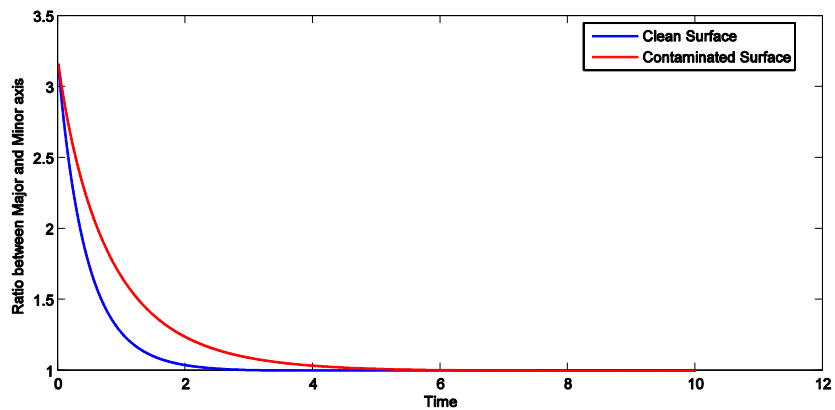


Figure 5: Comparison.

Transport of Brownian Particles from a Solid Obstacle at Large Peclet Numbers

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Abstract — Matched asymptotic analysis is used to find the analytical solution in the boundary layer for the transport of Brownian particles from a solid obstacle at large external force or small bulk diffusivity of particles, i.e., large Peclet numbers.

Keywords — Transport, Brownian particles, Peclet number, Asymptotic analysis.

Introduction

The transport of Brownian particles through a periodic pattern of obstacles (Figure 1) is a fundamental means of continuously separating particles with different properties in a microfluidic device [1-10]. The previous research has identified a challenge associated with the transport under the large external force or small bulk diffusivity of particles, which causes particle to accumulate at the interface and forms a thin boundary layer. This corresponds to the transport of Brownian particles at large Peclet numbers in the dimensionless form. Traditional numerical methods (finite element method) would be very expensive in order to resolve this transition layer accurately. Therefore the analytical results are desired to better understand this boundary layer and improve the efficiency of microfluidic device to separate particles.

For the simplicity, we consider the transport in an infinite domain (see Figure 1) where F is an external driving force and a solid circle with a radius R represents an obstacle. We suppose that the particle concentration is a constant ρ_∞ far from the solid obstacle ($r \rightarrow \infty$). The boundary condition at the surface ($r = R$) is the no flux condition. The motion of particles in the steady state is governed by the convection diffusion equation,

$$\frac{\partial}{\partial x} \left(\frac{F}{\eta} \rho - D \frac{\partial \rho}{\partial x} \right) + \frac{\partial}{\partial z} \left(-D \frac{\partial \rho}{\partial z} \right) = 0,$$

where η is the frictional coefficient, ρ is the particle concentration, and D is the diffusion coefficient. It is convenient to write this equation in the polar coordinate,

$$\frac{F}{\eta D} \left(\frac{\partial \rho}{\partial r} \cos \theta - \frac{\partial \rho}{\partial \theta} \frac{\sin \theta}{r} \right) - \frac{\partial^2 \rho}{\partial r^2} - \frac{\partial \rho}{\partial r} \frac{1}{r} - \frac{\partial^2 \rho}{\partial \theta^2} \frac{1}{r^2} = 0.$$

By introducing the following dimensionless parameters:

$$\tilde{r} = \frac{r}{R} \text{ and } \tilde{\rho} = \frac{\rho}{\rho_\infty}$$

we obtain the governing equation (after dropping the tilde),

$$Pe \left(\frac{\partial \rho}{\partial r} \cos \theta - \frac{\partial \rho}{\partial \theta} \frac{\sin \theta}{r} \right) - \frac{\partial^2 \rho}{\partial r^2} - \frac{\partial \rho}{\partial r} \frac{1}{r} - \frac{\partial^2 \rho}{\partial \theta^2} \frac{1}{r^2} = 0$$

with no flux condition $Pe \rho \cos \theta - \frac{\partial \rho}{\partial r} = 0$ at $r = 1$ and the far field condition $\rho = 1$ as $r \rightarrow \infty$.

The Peclet number $Pe = \frac{FR}{\eta D}$ measures the ratio of convection and diffusion. For the case of strong convective transport, i.e., F is large or D is small, there exists a boundary layer where the gradient of particle concentration is very large. If the regular asymptotic analysis is used, then leading order equation is only the equation of convection for which there is no steady state solution. Therefore it will be appropriate to use the matched asymptotic analysis to solve the boundary layer by rescaling the governing equation. The detailed solving process will be illustrated in the next section.

Method: Matched Asymptotic Analysis

In order to solve the problem in the boundary region ($r \approx 1$), it will be more convenient to redefine the variable in the form

$$r - 1 = y.$$

Therefore the obstacle surface is at $y = 0$ and we explore a solution in the region of small y . The thickness of the boundary layer is

$$y = Pe^{-m} Y$$

with an unknown positive parameter m . By substituting this rescaling into the governing equation, we can obtain the correct value for m by balancing the leading order terms in convection and diffusion.

$\left[\frac{\partial \rho}{\partial Y} Pe^{m+1} \cos \theta - \frac{\partial \rho}{\partial \theta} \frac{Pe \sin \theta}{Pe^{-m} Y + 1} \right] - \frac{\partial^2 \rho}{\partial Y^2} Pe^{2m} - \frac{\partial \rho}{\partial Y} \frac{Pe^m}{Pe^{-m} Y + 1} - \frac{\partial^2 \rho}{\partial \theta^2} \frac{1}{(Pe^{-m} Y + 1)^2} = 0$. So, for $Pe \gg 1$, the dominant convection term is $\frac{\partial \rho}{\partial Y} (Pe)^{m+1} \cos \theta$ and the dominant diffusion term is $\frac{\partial^2 \rho}{\partial Y^2} Pe^{2m}$. This leads to

$$m + 1 = 2m$$

or

$$m = 1.$$

After having the correct choice of m , we obtain the leading governing equation

$$\frac{\partial \rho}{\partial Y} \cos \theta = \frac{\partial^2 \rho}{\partial Y^2}$$

with the no flux condition $\rho \cos \theta - \frac{\partial \rho}{\partial r} = 0$ at $Y = 0$ and the matched far field condition $\rho = 1$ at $Y = Y_1$ where Y_1 is the dashed line in the Figure 1. Then the corresponding solution is

$$\rho = e^{(Y-Y_1) \cos \theta},$$

or

$$\rho = e^{(Pe(r-1)-Y_1) \cos \theta}.$$

The Figure 2 shows the particle distribution in the boundary layer where $Pe = 10$, $Y_1 = 1.5$, $r \in [1, 2.5]$, and $\theta \in [\frac{\pi}{2}, \frac{3\pi}{2}]$.

Conclusions

The matched asymptotic method is successfully used to find an analytical solution in the boundary layer as $Pe \rightarrow \infty$. Note that this solution is only valid near the front-stagnation point $\theta \in [\frac{\pi}{2}, \frac{3\pi}{2}]$. On the rear-stagnation region, particles will be carried away along the axis instead of accumulation so there is no boundary layer.

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Figures

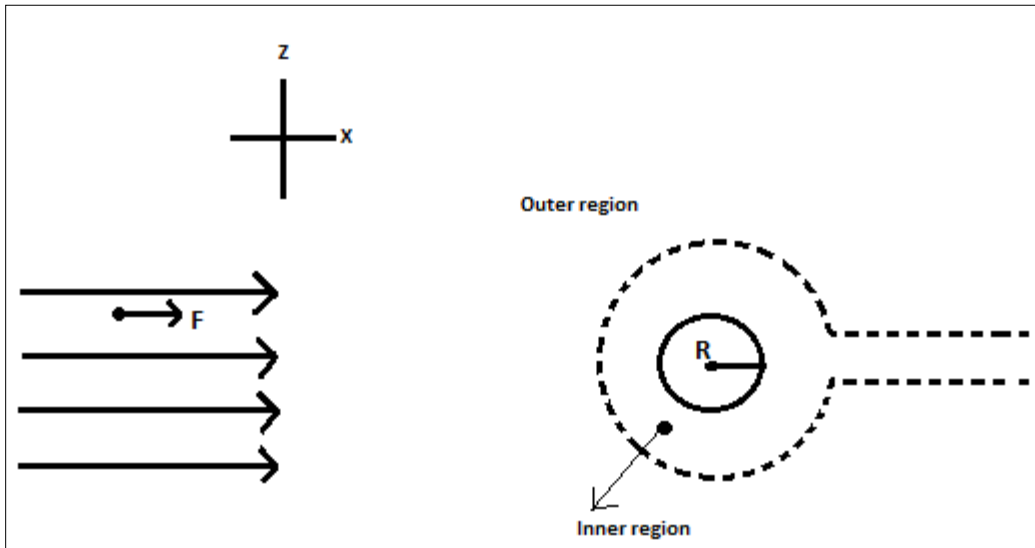


Figure 6: A schematic representation of the transport of Brownian particles in an infinite domain.

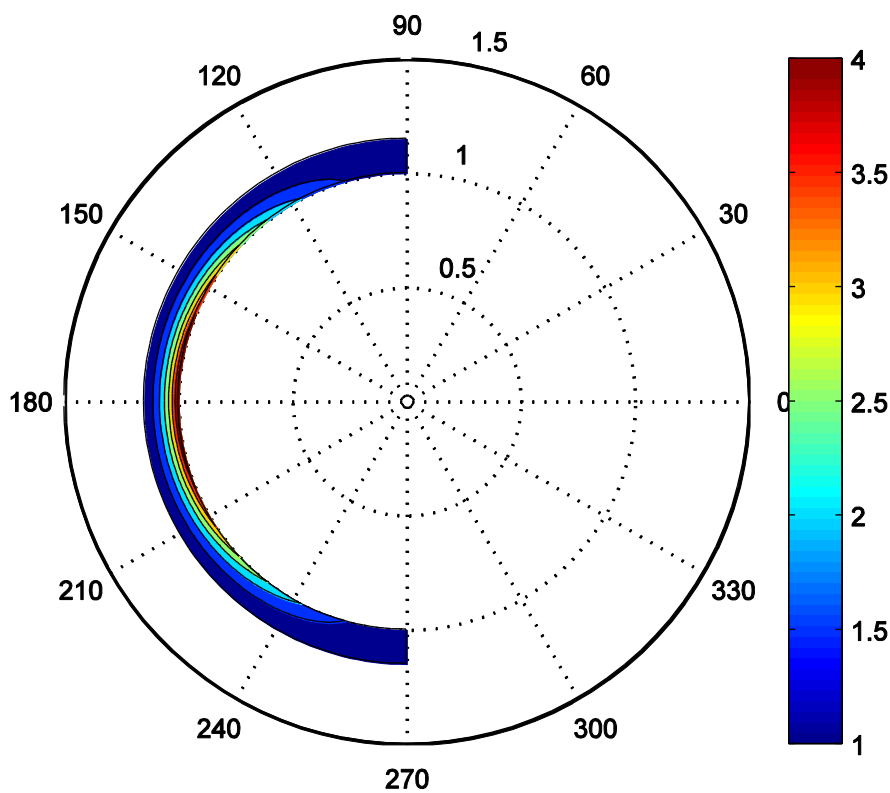


Figure 7: Analytical solution of particle distribution in the boundary layer.

Factors Influencing a Woman's Decision to Receive Medical Treatment for ¹Infertility

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¹ The Center for Disease Control and Prevention defines infertility as the inability to get pregnant after 12 consecutive months of unprotected sex with a husband

Abstract — Previous research has shown a definite connection between infertility and higher amounts of stress along with copious other negative mental health consequences. This makes one wonder why a woman would not seek treatment for infertility. Using an analysis of a primary survey of 68 women, this study examines factors that influence a women's decision to receive or decline treatment for infertility. The influence of income, previous children, beliefs about motherhood and family, ethical concerns, and social support are all factors that are examined in this paper. Respondents were divided into two groups; those who have received treatment and those who had not. The former (the treatment group) was analyzed based on their responses to treatment received while the latter (the hypothetical or control group) was analyzed based on responses to hypothetical treatment. Results suggest significant differences between the two groups. The findings provide important bases for understanding fertility treatment decisions and for developing appropriate policy.

Keywords — Infertility, Treatment, Motherhood, Women, Social support

Introduction

According to the Center for Disease Control and Prevention (CDC), infertility affects 6% of married women in the United States between the ages of 15 and 44 (CDC 2013). Additionally, eleven percent of women of the same age cohort will experience some difficulty in becoming pregnant or carrying a pregnancy to term (CDC 2013). The medical community generally defines infertility as the inability to conceive after twelve months of regular, unprotected sexual intercourse (CDC 2013).

At some point most women will have to make a decision about their intent to have children. For some this decision may be a result of carefully calculating the timing of a child and ensuring that her career and educational attainment are first fulfilled (Luker 1984). There are also the women who cannot have children due to medical reasons and thus the decision is biologically determined. It would be almost impossible to come up with a comprehensive and exhaustive list of how women

determine whether or not they wish to have children. The important thing to recognize is that there is usually a choice and that this choice affects a majority of women. What happens, then, when a woman has decided that she wishes to start a family and finds herself experiencing infertility?

Infertility can cause an array of negative outcomes for a woman - including, but not limited to, heightened stress, marital problems, and depression (Harvard Health Publications 2009). Miall's study found that women who were struggling with infertility felt like they had failed, were stigmatized, and overall ashamed because of their infertility (1986). Drawing from Pearlin's stress model (1989), McQuillan, *et al.* (2003) determined that infertility qualifies as a stressor. Although they examined several hypotheses, the authors ultimately found that a woman who wishes to have a child, yet remains childless, will experience the greatest amount of stress as a result of infertility and that this stress is most likely a result of losing the master status of "mother" (2003). Couples dealing with infertility can find themselves having marital problems due to the wife's inability to conceive (Deka and Sarma 2010), though there are also instances of male infertility (Cell Press, 2012). Couples may begin to fight about medical decisions, experience a decrease in sexual drive, and experience social isolation (Deka and Sarma 2010). Given these negative outcomes one must wonder why some women may choose to treat infertility while others do not. This paper examines factors that may influence whether a woman will seek treatment for infertility and, if so, to what extent? In particular, this study will examine the contribution of factors such as annual family income, current number of children, beliefs regarding family, motherhood and adoption, ethical and financial concerns, and amount of social support available.

Methods

Data for this study came from an original survey created on SurveyMonkey.com utilizing a combination of availability and snowball sampling

methods. The survey was initially administered to a network of friends from a social media website and to a private social media group consisting of Korean-American adoptees. One electronic mail copy was sent to a select group of friends. Participants were encouraged to send the survey to friends that they thought may be willing to respond to the survey. Respondents were given 7 days to access the survey.

In total 74 women over the age of 18 completed the survey. There were 6 women out of the 74 who were over age 55 and were therefore excluded from this analysis because they were most likely over the child bearing age. Of the remaining 68 women, an additional 14 were excluded from the analysis because they reported that they had experienced infertility and sought treatment. However, 2 women indicated that they sought some sort of treatment but did not indicate that they experienced infertility. These 2 respondents were included with the remaining 54 women who were of child bearing age but did not experience infertility or did not seek treatment if they experienced infertility.

Infertility was measured based on the respondent's answer to the question, "Have you had regular, unprotected sex (without the use of any contraception) for 12 consecutive months without becoming pregnant? (Note: This does not have to be in the last 12 months, it can be at any time during your life)". If the respondent answered "yes" she was considered to be infertile and coded as 1. Respondent who answered "no" were coded as 2. The direct question of asking a woman if she had ever been diagnosed as infertile by a medical practitioner was avoided for several reasons. The first reason was because a woman who was trying to get pregnant may have been trying for over a year but did not see a doctor before she was able to conceive. The second reason was because a woman may not be trying to become pregnant but be engaging in unprotected sex and would therefore be unlikely to bring this up to her doctor. Along those same lines, a woman may not have insurance or may not have wanted to go to a doctor. Lastly, a woman may feel stigmatized or may want to avoid labeling herself as infertile and this could have interfered with the results. Therefore, the question was created utilizing the medical definition of infertility rather than directly asking if a woman was infertile.

Respondents were asked to indicate if they had any children and this included step-child/children, biological child/children, and/or adopted child/children. Of the respondents that had children, only 2 did not have biological children in addition to step-children. Therefore, the

respondents were recoded as either having no children (1) or having children (2).

Two separate questions regarding treatment were asked during the survey. The first inquiry about infertility treatment was aimed at identifying the types of treatment a woman had used, if ever. Respondents were asked to select from a list of treatments any that they had received. The treatments selected for the survey came directly from research conducted by Stephen and Chandra (2000). Treatment options included: consulting a medical doctor and/or receiving advice from a doctor; fertility testing on self; fertility testing on partner; ovulation drugs; surgery or treatment for blocked tubes; artificial insemination; assisted reproductive technology; treatment for uterine fibroids; treatment for endometriosis; medical help to prevent miscarriage; surrogacy. Surrogacy was not included in the Stephen and Chandra research but added due to curiosity of the researcher. The second question regarding treatment posed a hypothetical question asking how likely the respondent would be to utilize any of the following treatments should she experience infertility. The treatments were exactly the same as the previous question and in the same order; respondents answered on a scale of 1 to 3 with 1 being "not likely" and 3 being "very likely".

During an initial analysis of the data, strong correlations were found among all of the hypothetical treatments. Therefore, all values for each individual treatment were summed for each respondent and turned into a continuous variable. A score of 11, which would be the least a respondent could score, would indicate that a woman answered "not likely" to using every treatment. A score of 33, which would be the highest a respondent could score, would indicate that a woman answered "very likely" to using every treatment.

Respondents were asked to select their annual family income based on increments of twenty thousand up to eighty thousand or more. Income will also be used as a proxy for health insurance coverage because all of the respondents that identified themselves as being uninsured also reported making forty thousand dollars a year or less.

A series of belief statements were listed on the survey and respondents were asked to rate each statement on a scale of 1 to 5, with 1 being "strongly disagree" and 5 being "strongly agree". These belief statements were constructed by drawing on research that found cultural and social factors as possible determinants of seeking treatment (Greil et al. 2011). The first four statements aimed to identify how important motherhood and family were to the respondent. The statements are as

follows: “Family is the most important thing in life”; “Becoming a mother is one of my main life goals or accomplishments”; “If I found out I could not become pregnant I would be devastated”; “I would do anything I could in order to treat infertility”. The following three statements were meant to identify if the respondents had any ethical, cultural, or financial concerns that would prevent them from using fertility treatment and was stated, “My personal/cultural/religious beliefs or financial situation would prevent me from using fertility treatment”. The two belief statements were trying to measure the respondent’s feelings about social motherhood. The first stated, “If I could not have children I would consider adoption” and the second, “I would consider adoption whether I could or could not become pregnant”. The last statement asked about the respondent’s outlook regarding their social support and was stated “I have a social support system that I can rely on”.

Results

Table 1, below, presents the correlation analysis of the two groups. There was no statistically significant correlation between hypothetical treatment and having children. The relationship between hypothetical treatment and children was slightly negative (-.21) which indicates that those that had children had an overall lower score on hypothetical treatment. For this set of data, income and infertility were not significantly correlated. Income was not significantly correlated with the respondent’s hypothetical treatment score. Insurance was positively correlated with hypothetical treatment scores (r value = .26; p = .056). This indicates that those who did not have insurance scored highest on hypothetical treatment. This means that they would be more likely to utilize the most services for infertility.

Five of the eleven belief statements had significant correlations to hypothetical treatment. Two of the statements assessing the respondent’s feelings about motherhood and family were significantly correlated with treatment. The first statement was “family is the most important thing in my life” (r value = .273; p value = .041). The second statement was “If I found out I could not become pregnant I would be devastated” (r value = .437; p value = .001). The statement regarding treatment, “I would do anything I could in order to treat infertility” was strongly correlated with hypothetical treatment (r value = .620; p value = .000). Lastly, the two statements regarding adoption were significantly correlated with treatment scores. The first statement, “If I could not have children I would consider adoption” had a

stronger correlation (r value = .439; p value = .001) than the second statement, “I would consider adoption whether I could or could not have children” (r value = .291; p value = .029).

Due to the small sample size for the group that received the treatment, there were no significant correlations. However, children and income were positively correlated with treatment received. In the hypothetical treatment group having children was negatively correlated with treatment. Additionally, it is not surprising that those who had higher incomes received more treatment. Insurance coverage and treatment were negatively correlated which is opposite to those in the hypothetical group. This indicates that those who did not have insurance received the least amount of treatment for infertility.

There were five belief statements that did not have similar correlations to each other. For the statement regarding treatment, “I would do anything I could in order to treat infertility”, there was a stronger correlation for the treatment group. Financial constraints were more strongly correlated for the treatment group than for the hypothetical group. The two belief statements assessing the respondent’s feelings towards adoption were positively correlated for those in the hypothetical group and negative for those in the treatment. The statement regarding social support also had a positive correlation for the hypothetical group but a negative correlation for the treatment group.

Discussion/Conclusions

Based on the results presented above we can infer a few things regarding treatment seeking behavior for women who are dealing with infertility. Having previous children appears to deter a woman from seeking infertility treatment. It is plausible that the women who received treatment had children as a result of their treatment, which obviated the need or desire to seek further treatment. This would explain the inverse relationship between the two different groups. Additionally, income and insurance appear to be important factors in receiving treatment. For the hypothetical group, these two categories were not an issue. As a matter of fact, women with no insurance reported that they would use the most treatments. However, in the group of women who had actually received treatment the reverse was true. It is possible that the women who actually received treatment are aware of the cost of treatment and have had to face the financial barriers to treatment.

For both the hypothetical and treatment group, the first four belief statements regarding

motherhood and becoming a parent were all positively correlated with seeking higher levels of treatment. The only difference between the two was regarding treatment. The treatment group had a lower correlation with treatment than the hypothetical group. This is possibly because those that had received treatment have a better idea of how far they could go in order to treat infertility. The respondents' belief about financial barriers to treatment was negatively correlated for both groups. Women who had the lowest financial concern received the most treatment. However, for those who actually received treatment the correlation was much stronger. This could be explained in the same way as the belief statement about treatment. Those who have received treatment know what the costs are and therefore would know their financial constraints better than those who may not have received treatment.

The belief statements regarding adoption had positive correlations for the hypothetical group but negative correlations for the treatment group. For those in the hypothetical group that scored highest on treatment they also were more likely to want to adopt. However, those in the treatment group who actually received treatment, the ones that scored highest on treatment scored lowest on wanting to adopt. Lastly, the hypothetical group had a positive correlation between social support and treatment. The treatment group, however, had a negative correlation between the two variables. Perhaps those that had received treatment have tested their social support system whereas the hypothetical group only assumes they have a social support system in place.

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Tables & Figures

Table 1: Factors Associated with Fertility Treatment Decisions

Hypothetical Group			Treatment Group		
HypoTx	Pearson Correlation	1	TotalTx	Pearson Correlation	1
	Sig. (2-tailed)			Sig. (2-tailed)	
	N	56		N	12
Family	Pearson Correlation	.273*	Family	Pearson Correlation	.30
	Sig. (2-tailed)	.041		Sig. (2-tailed)	.339
	N	56		N	12
Motherhoo	Pearson Correlation	.215	Motherhoo	Pearson Correlation	.216
	Sig. (2-tailed)	.111		Sig. (2-tailed)	.50
	N	56		N	12
Devastated	Pearson Correlation	.437**	Devastated	Pearson Correlation	.414
	Sig. (2-tailed)	.001		Sig. (2-tailed)	.181
	N	56		N	12
Tx	Pearson Correlation	.62**	Tx	Pearson Correlation	.325
	Sig. (2-tailed)	.00		Sig. (2-tailed)	.30
	N	56		N	12
Persona	Pearson Correlation	-.157	Persona	Pearson Correlation	-.167
	Sig. (2-tailed)	.24		Sig. (2-tailed)	.60
	N	56		N	12
Cultural	Pearson Correlation	-.147	Cultural	Pearson Correlation	-.167
	Sig. (2-tailed)	.278		Sig. (2-tailed)	.60
	N	56		N	12
Religious	Pearson Correlation	.012	Religious	Pearson Correlation	-
	Sig. (2-tailed)	.931		Sig. (2-tailed)	.782
	N	56		N	11
Financial	Pearson Correlation	-.061	Financial	Pearson Correlation	-
	Sig. (2-tailed)	.656		Sig. (2-tailed)	.143
	N	56		N	12
Adoption1	Pearson Correlation	.43**	Adoption1	Pearson Correlation	-.081
	Sig. (2-tailed)	.001		Sig. (2-tailed)	.80
	N	56		N	12
Adoption2	Pearson Correlation	.291*	Adoption2	Pearson Correlation	-
	Sig. (2-tailed)	.02		Sig. (2-tailed)	.34
	N	56		N	12
SocialSupport	Pearson Correlation	.20	SocialSupport	Pearson Correlation	-.395
	Sig. (2-tailed)	.133		Sig. (2-tailed)	.20
	N	56		N	12

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Evaluating Sex Differences in Migraines

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Abstract — *It is estimated that nearly 36 million people in the United States suffer from migraine headaches. On average, eighteen percent (18%) of these people are women while men account for only 6 percent. The highest prevalence rates and gender differences in migraines exist among Caucasians, while the lowest rates and gender differences appear among Asian Americans. This paper utilizes a mixed methodology consisting of a systematic analysis of previous studies and a case study to examine the gender differences in the experience of migraines and factors associated with those differences. Study findings suggest that the gender differences in migraines can be attributed mainly to the sex or biological differences between males and females. This study discusses these biological factors and also examines the contribution of other factors such as the individual's age, race, socioeconomic status, and family history.*

Keywords — Migraines, Sex, Gender, Treatment, Sociodemographic Factors

Introduction

Approximately 36 million people in the United States suffer from migraine headaches. However, migraines do not affect all people similarly. Females are 3 times more likely than males to experience migraines in adulthood. However, before puberty, males are more likely to experience migraines than females. According to a National Health Interview survey 21.8 percent of females had experienced migraines in the preceding three months, compared to only 10 percent of men (2009). Caucasians have been shown to have the highest prevalence rates for migraines, followed by African Americans, and Asian Americans (Stewart, Lipton, and Liberman, 1996)

According to the National Institute of Neurological Disorders and Strokes (NINDS), migraines are typically described as “an intense pulsing or throbbing pain in one area of the head.” Physicians diagnose migraines based on the pain experienced during the attack and the number of attacks a person has, at least 5 attacks lasting 4 to 72 hours. While mortality rates associated with migraines are not very well documented, migraines have been shown to be comorbidities for other more fatal illnesses such as stroke and heart attack. What has been clearly documented are the economic costs of migraines. United States

employers lose over 13 billion dollars a year, based on a loss of 113 million workdays due to migraine headaches (About Migraine 1991). The amount of lost work hours that are caused by migraines do not represent the lost hours of home life or social responsibilities that often go unquantified. Since females bear a disproportionate burden of the prevalence of migraines, it is therefore females who are losing the most work ability and money due to migraines. Given workplace gender inequalities that exist in our society, loss of productivity associated with migraines only exacerbate women's economic standing and hinder any progress towards gender economic parity.

The main objective of this paper is to examine the factors associated with gender differences in migraines. More specifically, this paper investigates the gender differences in the prevalence, experience, and treatment of migraines.

Methods

This paper relies on a systematic analysis of existing scientific studies on migraines. To be included in this analysis, the research articles had to 1) involve patients with migraines, 2) focus on U.S. populations, and 3) compare male and female respondents. Preference was given to peer reviewed articles. In addition, this paper also used a case study of a 56-year old female to gain first-hand knowledge of a personal experience with migraines.

Results

Table 1 summarizes the results from our analysis of existing studies. As the table shows, a total of 10 journal articles were selected and analyzed in detail. These articles were based on studies done between 1992 and 2013 and included respondents ranging from 12 to 80 years of age.

Discussion/Conclusions

Based on a detailed analysis of the articles presented in Table 1 above, the strongest predictor of gender difference in migraine was sex. Males and females are biologically different and the major reason behind females' prevalence for migraines is due to the changes in their hormone levels.

Fluctuations in females' estrogen levels are a primary cause of migraines in women (Pollock 2013). Women in their reproductive years are the most susceptible to migraines (Bigal et. al. 2006). This can be linked to the fact that their hormone levels are constantly changing during this time. Our case study reported that her migraines were the most frequent and most intense in pain when she was between 30 and 35 years of age. She reported that her migraines started when she was 14 years old – the same time as the beginning of her puberty. This supports findings that link migraines with fluctuations in estrogen levels. When females begin puberty, their estrogen levels begin to fluctuate, which explains how puberty and migraines can be contemporaneous.

Not only are females more prone to having migraines than males. The ways that females experience migraines are different from the way in which males experience them. Females' and males' brains process pain differently. As a result a male could possibly be experiencing a migraine similar to that of a female but because the male brain does not process the pain the same way, the male may not report it as a migraine (Fishman 2013). A probable reason for this is that women have a lower pain threshold and tolerance than men (Mann 2010). A study on 80 healthy students yielded findings that showed that females reported more intense pain and engaged in pain behavior for a longer period of time than males (Sullivan, Tripp, and Santor 2000). Migraines may therefore appear more common in females because males are not reporting the same levels as females.

Other demographic factors such as race, socioeconomic status, and family history, have been shown to have an impact on a person's likelihood of having migraines. For instance, a study based on United States males and females showed that, for both sexes, Caucasians were significantly more likely to have migraines than African Americans and Asian Americans (Stewart et. al. 2006). Regarding socioeconomic status (SES), individuals living with a low SES (less than \$10,000) were found to be at an increased risk for migraines relative to individuals living with a moderate to high SES (Stewart et. al. 1992). Future studies can examine the reasons for these other differences.

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Tables

Table 1: Summary Findings Migraines from Scholarly Journals

Author	Sample Size	Sample Population	Objective	Findings
Bigal <i>et al.</i> , (2006)	145,335 (migraines prevalent in 15%)	18+ years old participants in 3 urban centers	To contrast migraine prevalence across the life span	Migraine prevalence changes over the life span and is most prevalent between the ages of 30 and 39
Stewart <i>et al.</i> , (1996)	12,328	Baltimore County, Maryland men and women 18-65 years of age	Determine the variation in migraine prevalence by race	In the United States, migraine prevalence is highest in Caucasians
Winter <i>et al.</i> , (2012)	36,858	Participants in a Women's Health Study	Evaluate the association of socioeconomic status with the prevalence of all headache forms (including migraines)	Low socioeconomic status is associated with an increasing prevalence for all headache forms (including migraines)
Dzolja <i>et al.</i> , (2013)	245	Female students with migraines	Find out the influence of family history on prevalence of migraines	People with migraines are more likely to have a family history of migraines than not
Silberstein <i>et al.</i> , (2000)	123	Subjects with a history of 2 to 8 moderate-to-severe migraine attacks per month	Assess the safety and efficacy of botulinum toxin type A in the prevention of migraines	Botulinum was found to be a safe medication and significantly lowered number of migraine attacks per month, as well as their severity
Lipton <i>et al.</i> , (2001)	3,577	Individuals with migraines based on the International Headache Society (IHS) criteria	Describe the patterns in migraine medication use	Just under half of diagnosed migraineurs used prescription medications and over half used over the counter medications to treat migraine symptoms
Osterhaus <i>et al.</i> , (1992)	648	Respondents that met HIS migraine criteria	Evaluate the lost labor due to migraines	Close to 100% of employed respondents experienced negative effects on their job and more than half missed work days each month
Sullivan <i>et al.</i> , (2000)	80	Healthy students who participated in an experimental pain procedure	Examine gender differences in pain and pain behavior	Females reported more intense pain and engaged in pain behavior for a longer period of time than males
Stewart <i>et al.</i> , (1992)	20,468	Respondents ages 12 to 80 years	Examine prevalence by gender, age, race, and household income	Significantly higher rates of migraines in females, age group 35 to 45 years old, and the lowest income group (<\$10,000)
Pharmacotherapy	23,611	United States respondents living in 9,507 households	Evaluate gender-based differences in migraines	Three times as many females as males reported moderate to severe disability with their migraine. Before age 12 years migraines were more common in males

Why Black Women have Higher Mortality Rates for Breast Cancer compared to White Women

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Abstract – Existing studies show that the incidence for breast cancer is higher among White women compared to their Black counterparts. However, studies show that mortality rates for breast cancer are higher among Black women than in White woman. Through a systematic review of refereed journal articles based on U.S. populations between 1985 and 2008, this study examines some of the reasons behind this racial disparity in breast cancer mortality rates. Of the six studies included in the current analysis, only three studies shared in common with types of breast cancer treatment, timing of treatment, and stage of diagnosis among black and white women. Black women had higher rates and poor outcomes of these. Two studies showed Blacks views and negative feelings about mistrust in the physicians and medical establishment, fear of chemotherapy and radiation. Only one study showed that younger white women and older black women had higher barrier goals for mammogram screening. This analysis concludes that racial disparities in breast cancer mortality rates are due to lack of knowledge about breast cancer, lack of mammogram screening, failure to seek treatment early, fear, low Socioeconomic Status (SES) and lack of health insurance

Keywords – Breast Cancer, Gender, Race, Mammogram Screening, Disparity

Introduction

Breast cancer is the common term for a cancerous tumor that starts in cells that line the ducts and lobes of the breast (Hartmann and Loprinzi, 2005). In the United States 1 out of every 8 Caucasian women will develop breast cancer compared to 1 out of 11 African American women. It is the most common cancer in African American women, and the second most common cancer in other racial groups. The American Cancer Society estimates that there are approximately 232,340 new cases of invasive breast cancer (American Cancer Society, 2013). It is also estimated that 6,080 deaths occur just among African American women alone (Susan G. Komen, 2013). African American women are more likely to develop more aggressive and more advanced-stage breast cancer that is diagnosed at a young age. Triple-negative breast cancer which is more aggressive than other types is more common in African American women (Breast cancer.org, 2013). According to the CDC,

black women have the highest breast cancer mortality rates of all racial and ethnic groups and are 40% more likely to die of breast cancer than Caucasians. In any one year 31 out of every 100,000 African American women can die from breast cancer (Frisby, 2006). In addition, while mortality trends for White women have decreased by 2.1% per year, the rates for black women have decreased by only 1.4% per year. According to reports from Surveillance and Health Services Research, mortality rates for breast cancer are higher among Black women than all racial groups (at 30.8 per 100,000). The rates in White women are 22.7 per 100,000. The main objective of this study is to examine factors that investigate the factors associated with higher breast cancer mortality rates in black women compared to their white counterparts.

Methods

This paper is based on an analysis of journal articles from a search of electronic databases including MEDLINE, Women Studies International, Psychology, Behavioral Science Collection, and JSTOR. The journal articles included in this analysis were those published between 1996-2012. A series of keywords were used such as “breast cancer”, “mortality”, “mammogram”, “race”, “treatment”, and “socioeconomic status” to yield the highest number of articles possible. Reference lists of retrieved were subsequently used to identify additional, relevant articles. This study also found data and statistics from Center of Disease Control and Prevention (CDC) and the American Cancer Society websites.

Results

A total of 12 references were identified from the literature search, 6 of which were excluded because they did not have sufficient information for the purpose of this analysis. Only six articles met the study's selection criteria. The results are described in Table 1.

Discussion/Conclusions

This study analyzed published studies on breast cancer to understand why breast cancer mortality rates are higher among Black women, relative to their White counterparts. The six studies that were reviewed were associated with women's views and effects, and experiences on breast cancer screenings and treatments. Bradley *et al.* (2002) did a fairly diverse study on women of different races and examined breast cancer stage at diagnosis, treatment, and survival. The findings suggest that Black women were less likely to receive surgery than white women. Black women who received surgery were more likely to have breast-conserving surgery than white women. Low socioeconomic status is a risk factor for unfavorable breast cancer outcomes regardless of race. However, the fact remains that Black women are more likely to have lower incomes than White women. Lower income and less educated Black women are three times more likely than higher income Black women to have breast cancer diagnosed at a later stage when the cancerous tumors are much larger and the treatment prognosis more dire (Gibson, 2008).

Elmore *et al.* (2005) investigated three specific questions: Does the method of breast cancer detection differ by race? Do delays in timing of the diagnosis and treatment vary by race? If differences are noted in the method or timing of clinical care, do those differences affect the initiation of treatment and treatment outcomes? For those three questions the study found that Black women were more likely than White women to be diagnosed after the patients noted abnormality. Women diagnosed after patient noted abnormalities were more likely to have more advanced-stage breast cancer and to experience breast cancer reoccurrence or death. In addition, black women were more likely than white women to be uninsured or covered by Medicare or Medicaid. This tended to affect the timing, type, and quality of care received. After being diagnosed, the timing of initiation of treatment showed that black women had not started treatment within 30 days of the diagnosis compared to white women who had long started treatment by that time.

Hershman *et al.* (2009) studied a population of black and white women to see the association between race and treatment discontinuation and delay, white blood cell counts, and survival in women enrolled into breast cancer clinical trials. The authors found that black women were more likely to discontinue their breast cancer treatment and to experience treatment delay. The Hershman study did not give a clear reason to why this may happen other than for missing treatment for different reasons. Black women with breast cancer

also had lower ANC and WBC - which affected the dose and intensity of treatment. This could explain why Blacks received less chemotherapy than Whites.

The study by Masi *et al.* (2008) included Black men and women to characterize the perceptions on breast cancer treatment among Black men and women. The study found concerns expressed about mistrust of the medical establishment, racism and lack of quality health care. In addition, the study also found negative effects of surgery, radiation therapy, and chemotherapy among the participants. The findings of this study corroborated other studies such as by Gibson (2008) that have concluded that the differences in breast cancer survival rates are associated with unequal availability of prompt, high quality treatment (Gibson, 2008).

Rawl *et al.* (2008) examined age and racial differences in mammography beliefs in a group of women insured through Medicare or Medicaid funding. This study asked several barrier questions about the time it takes for a mammogram, the pain of a mammogram, etc. Blacks were more likely to have lower perceptions of and increased fear of mammograms. For instance, Black women were more likely to state that mammograms exposed too much radiation. They were also less likely to remember to schedule a mammogram. In addition, older Black women and younger White women had the highest total barrier scores regarding mammogram screenings. Also the study found that more black women do not believe that having a mammogram decreases the chance of dying. Previous studies have shown that Black women believe that the diagnosis of cancer will result in a death sentence, regardless of whether they have mammograms or not (Gibson, 2008). As a result, black women are less likely see mammograms as efficacious.

Peek *et al.* (2008) explored the reason for fear associated with breast cancer among low-income Black women. In their study women reported concerns about physicians and medical errors, and concerns about unethical experimentation. Much of the fear women discussed in the study came from lack of accurate information and poor communication between patients and their health care providers. African Americans are less likely than whites to have their doctors discuss treatment plans and preventive health care during clinical encounters, which suggest that racial disparities may exist in women about screening mammograms (Olivia *et al.* 2001). In addition, Peek *et al.* (2008) also shows that religion and spirituality play a role in black women diagnosed with breast cancer and their belief that God will heal them even if they

don't seek breast cancer treatment. Studies have shown that the belief in the power of prayer and the power of God's healing serve as barriers to breast cancer screening (Gibson, 2008)

Conclusions

Black women in the United States are still dying from breast cancer more than white women. This study identified factors and racial disparities associated with mortality in breast cancer. Based on our analysis, breast cancer mortality disparities can be associated with lack of mammogram screening, lack of knowledge about breast cancer, women not seeking treatment, fear, low SES, and being underinsured or not insured. Black women are diagnosed with more aggressive tumors and are less likely to continue treatment or are late to undergo treatment for breast cancer. However even though our analysis found factors associated with racial differences in breast cancer mortality our study did not include information on exactly why black women experience some of the factors discussed in this study that increase their mortality rates, relative to that of their white counterparts. In future studies researchers need to frame new research questions to better understand why African Americans experience some of the constraints and limitations that were identified in this analysis. Future studies also need to examine why breast cancer in Black women is more aggressive. On the other hand, the findings of our study indicate a need for greater education by health care professionals to patients, particularly black women, to help address some of the apprehensions that black women have about mammograms and to promote mammogram screenings as ways to help reduce noted racial disparities.

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Tables & Figures

Table 1: Six Studies of associations with breast cancer mortality between Black and White Women

Study	Study Year	N = Study Pop.	Objective	Findings
Bradley <i>et al.</i> 2002	1996-1997	N=5719 W=4609 B=1110 A=54 U=184	To disentangle the influence of race and socioeconomic status on breast cancer stage at diagnosis, treatment, and survival.	Black women had a higher likelihood of breast cancer outcomes than White women. There was no statistically significant association between race and unfavorable outcomes. Low SES was associated with stage of diagnosis, type of treatment received, and death.
Elmore <i>et al.</i> 2005	1985-1993 and June 20, 2001	N=466 A=120 W=346	To investigate whether the method of breast cancer detection, the timing of diagnosis, and treatment vary by race.	Black women were more likely than White women to be diagnosed after patient noted certain abnormalities and were more likely to have breast cancer recurrence and/or death due to breast cancer than white women who were diagnosed after mammogram screening.
Hershman <i>et al.</i> 2009	2006	S8814 vs. S8897 N=634 A=41 vs. A=276 W=41 vs. W=276	To assess the association between race and treatment discontinuation/ delay, White blood cell counts, and survival in women enrolled onto breast cancer clinical trials	Black women were more likely to delay or discontinue their breast cancer treatment than whites. Black women with breast cancer had lower baseline ANC and WBC. Relationship between race and dose intensity in treatment show that Blacks received less chemotherapy than Whites.
Masi <i>et al.</i> 2008	2008	N= 445 BW=280 BM=165	To characterize perceptions on breast cancer treatment among African American women and men.	There is general mistrust of the medical establishment and federal government among black women. In addition, black women were more likely to lack of health insurance and to also get lower quality of care, less aggressive treatment, and experience more negative effects of surgery, radiation therapy, and chemotherapy.
Rawl <i>et al.</i> 2000	2000	N=648 W=463 B=185	To ascertain age and racial differences in mammography beliefs in a group of women insured through health maintenance organization and through Medicare or Medicaid funding.	Older Black women and younger White women had highest total barrier scores about mammogram screenings.
Peek <i>et al.</i> 2008	2008	N=29 (African American Women)	To explore the reason for fear associated with breast cancer screening among low- income African- American women.	Fear and other psychosocial barriers to mammogram utilization associated with negative health care experience, fear of the health care system, denial and repression, psychosocial issues, delays in seeking health care, poor health outcomes and fatalism

Abbreviation: A=Asian; B=Black; U=Unknown; W=White; BM=Black men; BW=Black women
ANC=Absolute neutrophil count; WBC=White Blood Cell count

The Existence of Implicit Racial Bias in Nursing Faculty

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Abstract — *In schools of nursing in the US, disparate program completion and NCLEX pass rates exist between White students and students of color. This study examines what may be contributing to lower success rates for nursing students of color, namely unrecognized faculty bias toward the student of color. The study is grounded on the premise that nursing education and nurse educators cannot remove themselves from the greater cultural influences present in the US, specifically racism. It follows that establishing the existence of racism in nursing education, and the bias that proceeds from and helps maintain it, could provide valuable information about the faculty/student of color relationship and, ultimately, insight into experiences that may influence recruitment, retention, and success of students of color. Research, however, has shown a substantial difference in how health care providers respond to questions of explicit bias (bias that can be measured in written surveys) and bias that is essentially unconscious to that provider (implicit bias). Using the Implicit Association Test, this study explores the existence of implicit racial bias among nurse educators in BSN programs in the US.*

Keywords—Nursing education, racism, Implicit Association Test

Introduction

The quest for a more diverse nursing profession that provides better care for an increasingly diverse population in the United States has fueled countless conversations about how nursing education can attract and support more under-represented students. In spite of efforts to recruit and support students, disparate program completion and NCLEX-RN pass rates exist between White students and students of color. This study examines what may be contributing to lower success rates for nursing students of color, namely unrecognized faculty bias toward the student of color. The study is grounded on the premise that nursing education and nurse educators cannot remove themselves from the greater cultural influences present in the United States, specifically racism. Racism is defined as an institutional and systemic process whereby a group of people is restricted in achieving full access to the benefits of that institution. Bias is a personal attitude toward others that manifests itself in a variety of ways. It follows that establishing the existence of racism in

nursing education, and the bias that proceeds from and helps maintain it, could provide valuable information about the faculty/student of color relationship and, ultimately, insight into experiences that may influence recruitment, retention, and success of students of color.

Research has shown a substantial difference in how health care providers respond to questions of explicit bias (bias that can be measured in written surveys) and bias that is essentially unconscious to that provider (implicit bias) (Green et al., 2007). This study explores the existence of implicit racial bias among nurse educators in Bachelor of Science in Nursing (BSN) programs in the United States. It uses the Implicit Association Test, an internet-based program that measures unconscious bias toward people with different skin tones. This is important information for nurse educators to have because under-represented student recruitment and retention programs may be undermined if the encounter between the student of color and the faculty member is strained because of unconscious expressions of racial bias. In bringing implicit bias to consciousness, educators have the opportunity to address, through training and dialogue, ways in which the classroom can become a more open, welcoming, and power-balanced environment. This hospitable academic environment would hopefully lead to higher levels of program completion and NCLEX-RN pass rates.

Racism and Implicit Bias in Nursing

Implicit vs. Explicit Bias

The idea that human behavior is influenced by unconscious (implicit) thoughts and beliefs has long been central to psychological theory (Nosek, Greenwald, & Banaji, 2007). Although popular thought supports the idea that people have control over their beliefs and behaviors, empirical studies increasingly show that they do not (Nosek et al.). Implicit attitudes and behavior are automatically activated without conscious awareness of underlying motivation on the part of the individual. Tools like the Implicit Attitude Test (IAT) are designed to measure individuals' automatic evaluations by circumventing conscious thought. The specific technology of the IAT is beyond the

scope of this paper, but it is often considered to be as important a discovery as the telescope or the microscope in its ability to make the invisible visible (Payne, Burkley, & Stokes, 2008).

On the other hand, measuring explicit thoughts and attitudes depends on the respondent's ability to self-report, usually in the form of an interview or questionnaire (Payne et al., 2008). In responding to written or oral measures of explicit attitude, the respondent must interpret the question, evaluate their response, and codify it on a scale. These two forms of measuring attitudes (implicit and explicit) result in divergent data. The differences are especially significant when racial bias is the attitude being measured (Payne et al.). The question asked by psychologists is why implicit and explicit attitudes vary. According to Payne et al., there are two predominant theories as to how these differences occur in people. The first is that people hold several different attitudes at the same time. This holding of disparate beliefs and points of view occurs as people's attitudes change and new ideas are layered over previous beliefs and attitudes. The authors propose that when people respond to questions, they access the most current attitude. Previous attitudes still exist at a deeper level and are more difficult for the individual to explicitly access. These deeper attitudes can be accessed via the use of implicit measurement tools.

The second theory is that explicit and implicit measures are not measuring separate attitudes. Rather, explicit and implicit measures simply allow the individual to edit their response to different degrees. Therefore, the implicit attitude test is simply measuring an attitude before it has gone through the editing process (Fazio, Jackson, Dunton, & Williams, 1995; Payne et al., 2008). Whichever the case may be, it is important to recognize the distinctions between implicit and explicit bias and how they uniquely manifest themselves in individuals and society.

Theoretical Framework

Critical race theory (CRT) provides support for this study of implicit bias within a post-structuralist framework. CRT and post-structuralism move the conversation about the existence of implicit bias beyond one of individual beliefs and attitudes to one of power structures within the larger society.

Post-structuralism is predicated on the belief that human beings are products of the entirety of their experiences including all social interactions and natural processes that occur in their lives (Crotty, 2003). At the same time, these social interactions and natural processes create and inform all other social and natural process.

Individuals are formed by the politics, economic conditions, culture, technology, climate, popular consciousness, and the laws and political relationships that surround them. Individuals are also determined by their existence in a particular place and time. At the same time, individuals influence and change these social and natural processes. In a post-structuralist view of the world, there is no separation between the individual and their environment (Sandoval, 2000).

Critical race theory takes a post-structuralist view on one social issue—racism. It asserts that racism is a socially constructed process that creates and sustains differential opportunities for racialized groups. It is not an individual process, but one that is pervasive and systemic (Vaught & Castagno, 2008). As such, racism permeates both interpersonal relationships and social, political, and economic institutions. Racism can also adapt to changes in society, but it never disappears. As a consequence, studies conducted within a critical race framework must address the systemic nature of racism and question the notion of a color-blind society (Vaught & Castagno, 2008).

Nursing places a strong emphasis on empathy and caring of the individual (Barbee, 1993). Along with this emphasis on empathy is a belief that all patients should be treated equally, supporting the belief that nurses are providing egalitarian, non-discriminatory care. Multiple nursing theorists support these tenets including Leininger, Watson, Roy, and Orem (Parker, 2001). The problem arising from these individual-focused theories is that they preclude the nurse from identifying the larger structural institutional pressure influencing nursing and nursing education. In the case of this study, those larger issues include institutional racism and the implicit bias that supports it.

Methodology

The following research question guides this study: To what degree does implicit racial bias towards people of color exist in nursing faculty teaching in BSN programs in the United States? In terms of the results of the Implicit Association Test, this question could be worded alternatively: To what degree do nursing faculty teaching in BSN programs hold pro-White attitudes (Greenwald, McGhee, & Schwartz, 1998)?

This quantitative study was conducted within a descriptive, correlational research design. Participants were purposefully chosen from rosters of baccalaureate nursing faculty on university and college websites. Aside from choosing faculty who taught in baccalaureate programs, enrollment size and geographic location of the university were the only variables that could be externally controlled.

Participants were sent an email inviting their participation in the study. Clicking on an attached link allowed participating faculty to complete the skin tone IAT. The skin tone IAT was chosen for this study because the faces in the test resembled the varied student phenotypes present in a typical classroom. Through completion of a series of training blocks (where participants practiced using the IAT program) and combined blocks (where actual data was collected), participants' level of implicit bias was measured.

Explicit scores were obtained through three questions asking about feelings toward light- and dark-skinned people. Answers to Question 1—"Which statement best describes you?" were scaled from 1 to 7 with 1—*I strongly prefer Light-skinned people to Dark-skinned people* and 7—*I strongly prefer Dark-skinned people to Light skinned people*. Questions 2 and 3 were thermometer scales asking, "Please rate how warm or cold you feel toward light-skinned people" and "Please rate how warm or cold you feel toward dark-skinned people." On this scale, 10 was *very warm*, 1 was *very cold*, and 5 was *neutral*. In order to correlate IAT with explicit scores, explicit scores needed to be converted through standardization by range so that both scales (IAT and explicit) had the same -1 to 1 range with a 0 point (Greenwald et al., 2003).

Results

Of the 139 respondents, 91 completed both the implicit and explicit measures. Demographic data showed good variability with regard to age, years in nursing education, and geographic location. Although ratios were similar to the general nursing population, there was little variability in race, ethnicity, and gender (2 males, 2 African-Americans, and 1 Latino completed the entire survey). Given that White women control and maintain the institution of nursing education in the United States, this sample represented those in power.

The next step was to determine whether IAT scores were significantly different from zero, thereby documenting a moderate level of implicit bias within this sample. IAT scores ($M = .35$, $SD = .424$) were significantly different from zero ($p < .01$) for the 107 participants who completed the IAT.

In the final step of data analysis, the divergence between implicit and explicit measures of bias was determined. A paired, two-sample *t*-test was conducted on data from 91 participants who completed both the IAT and explicit questionnaire. The IAT ($n = 91$, $M = .330$) and explicit questionnaire ($n = 91$, $M = .101$) were highly correlated ($p < .01$, $t = 5.057$, Pearson $r = .239$), meaning that there was a significantly lower level of

bias reported on explicit measures (questionnaires) than on the IAT. These results are consistent with both the theoretical and empirical literature highlighting the strong tendency for respondents to provide socially desirable answers to explicit measures. The IAT scores and IAT/explicit correlations gathered in this study were not statistically different from data gathered on the Project Implicit public website from 122,000 participants from March 2001 to May 2006 (Nosek et al., 2007).

Conclusions

This exploration of the existence of implicit racial bias in nursing faculty established that a moderate level of implicit bias existed in this sample of nurse educators. While this information could be viewed as an individual phenomenon, something to be "dealt with" on an individual basis, the power of this study lies in viewing racism as a social construction that must be examined within the context of the greater societal institutions that hold it in place. In the case of nursing education, the greater institution is by and large White and female. Harris (1993) discusses the challenges of transforming this system by pointing out that "what persists is the expectation of White-controlled institutions of the continued right to determine meaning" (p. 1762). In other words, an examination of the persistence of bias, racism, and White privilege within nursing education would require critical and difficult conversations about who maintains power over process and knowledge.

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Decreasing Hemolysis Rates in Emergency Department Patients

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Abstract — Hemolysis rates of blood specimens collected in nationwide emergency departments have increased to rates over the best practice benchmark level of three percent due to collection techniques. The purpose of this evidence-based practice project was to determine if a change in the nursing practice guideline is necessary to decrease coagulation rates of collected blood specimens by focusing on the blood collection techniques of intravenous catheter draw or venipuncture. The clinical question was “In Emergency Department patients, does collecting blood specimens from closed venipuncture methods or peripheral vascular access reduce hemolysis rates?” One nursing practice guideline, one level I systematic review article, one level IV and level V quantitative articles reporting descriptive research were found and analyzed in this project. Results were that acceptable blood specimen rates can be achieved by nurses by utilizing venipuncture collection technique rather than peripheral venous access. Based on this evidence it is recommended that hospitals create protocols that reflect the best practice for the collection of blood specimens which is venipuncture, except in situations of difficult venous access or risk of increased bleeding.

Keywords — hemolysis, blood specimens, intravenous, venipuncture

Introduction

Hemolysis rates of blood specimens collected in nationwide emergency departments have increased to rates over the best practice benchmark level of three percent due to collection techniques. The purpose of this evidence-based practice project was to discuss methods of decreasing coagulation rates of blood specimens via collection technique and determine if a change in the nursing practice guideline is necessary. The clinical question was “In Emergency Department patients, does collecting blood specimens from closed venipuncture methods or peripheral vascular access affect hemolysis rates?”

Population: Emergency Department patients having blood specimens collected
 Intervention: Closed venipuncture devices
 Comparison: Peripheral access
 Outcome: Hemolysis

Method

The objective of the evidence-based practice project was to explore increased coagulation rates in blood specimens and their relationship to various collection techniques. To better understand this issue the group researched measurements of the incidences of hemolyzed blood specimens drawn by intravenous catheter versus venipuncture in emergency department patients. Three different articles and one nursing practice guideline were utilized for the literature review of this project. The first article, *Nursing Blood Specimen Collection Techniques and Hemolysis Rates in an Emergency Department: Analysis of Venipuncture Versus Intravenous Catheter Collection Technique* discussed the reduction in the number of hemolyzed blood specimens by utilizing venipuncture versus intravenous methods (Lowe, et al, 2011). The second, *One Poke or Two: Can Intravenous Catheters Provide An Acceptable Blood Sample? A Data Set Presentation, Review of Previous Data Sets, And Discussion*, demonstrated that acceptable low rates of blood specimen hemolysis were achievable by collecting via intravenous methods (Dietrich, 2013). The third article, *Obtaining Blood Samples from Peripheral Intravenous Catheters: Best Practice?* synthesized evidence associated with hemolysis and rates of hemolysis based on mechanics of collection technique (Halm & Gleaves, 2009). The nursing practice guideline, *World Health Organization (WHO) Guidelines on drawing blood: best practices in phlebotomy*, documents best practice techniques in the collection of blood specimens (WHO, 2010).

Findings

Findings in the Nursing Research Literature

The literature search resulted in one nursing practice guideline, one Level I systematic review article, one level IV and one level V quantitative descriptive article. One discussed the reduction in the number of hemolyzed blood specimens by utilizing venipuncture versus intravenous methods. Eleven randomly assigned emergency department nurses collected a total of 853 blood specimen; 498

specimens (58.4%) were collected via intravenous catheter and 355 specimens (41.6%) were collected via venipuncture. From the specimens collected, 28 specimens collected via intravenous catheter (5.6%) were hemolyzed, and one specimen collected via venipuncture was hemolyzed ($\chi^2 < 0.001$). The researchers concluded that the number of hemolyzed specimens can be reduced by emergency department nurses from venipuncture collection technique and this practice should be the standard of care in the emergency department setting (Lowe et al., 2008).

A second article addressed the fact that low rates of hemolysis from collected blood specimens were achievable from intravenous collection technique. In this study 8,944 blood specimens were collected; 3,803 collected via intravenous start by emergency department nursing staff resulting in 41 specimens hemolyzed (1.10%), 1,840 collected from existing intravenous access (inpatient nursing staff) resulting in 14 specimens hemolyzed (0.80%), and 3,301 collected via venipuncture (phlebotomist or laboratory technician) resulting in 3 specimens hemolyzed (0.10%). The researchers concluded that acceptable blood specimens were collected via intravenous catheter technique because coagulation rates were below the 2% level which is the benchmark for best practice (Dietrich, 2013).

A nursing practice guideline documented the best practice techniques in the collection of blood specimens. It concluded not to collect blood specimens from intravenous catheter technique due to the possibility of causing false results and hemolysis (World Health Organization, 2010).

An article titled *Obtaining Blood Samples From Peripheral Intravenous Catheters: Best Practice?* (Halm & Gleaves, 2009) reviewed factors associated with hemolysis and rates of hemolysis based on collection technique. Eight studies were retrieved in this review and revealed that 3.3% to 77% of blood specimens hemolyzed via intravenous catheter collection and 0% to 3.8% hemolyzed via venipuncture. The researchers concluded that blood specimens should be obtained via venipuncture and not from intravenous catheters.

Conclusions

Based on findings from nursing research articles and the nursing practice guideline, utilizing venipuncture rather than peripheral venous access in the collection of blood specimens decrease

coagulation rates. Patient care is delayed in many overcrowded emergency departments due to recollection of hemolyzed blood specimens. Time is an important aspect in the treatment of patients. Blood specimens will often be collected by nurses via the intravenous technique when the line is initiated to decrease patient discomfort and increase efficiency by avoiding a second venipuncture. However, the evidence concludes that collecting blood specimen via intravenous access results in higher coagulation rates and an overall delay in patient care due to the need of the patient having to endure a second stick. The reviewed literature suggests that venipuncture should be the standard of practice for the collection of blood specimens except for patients who have difficult venous access or risk of increased bleeding.

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Variation in implementation of electronic health record (EHR) functionalities across hospital characteristics

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Abstract — **BACKGROUND:** *The American Recovery and Reinvestment Act's Health Information Technology for Economic and Clinical Health (HITECH) provision of 2009 seeks to incentivize provider adoption and use electronic health records (EHRs) in a "meaningful" way, including functions related to error reduction and cost containment. Understanding the implementation of EHR functionalities by hospital structural characteristics is important for understanding the current state of use. METHODS: The 2010 American Hospital Association Information Technology Supplement was merged with the 2010 Nationwide Inpatient Sample. The final sample included hospitals present in both datasets (n=347). Bivariate analyses using chi-square significance tests were used to determine if level of EHR implementation for five computerized provider order entry (CPOE) and five clinical decision support (CDS) functionalities varied by hospital ownership (profit status), teaching status, and rural/urban location.. RESULTS: Bivariate analyses revealed significant relationships between level of implementation for four CDS functionalities (clinical guidelines, clinical reminders, drug allergy alerts, and drug-drug interaction alerts) for location. Significant relationships were also detected across implementation level of all CPOE and CDS functionalities for teaching status and only for the CPOE functionality nursing orders for profit, non-profit, and government owned. CONCLUSION: The HITECH provision initiatives could play a vital role in achieving the goal of title III of the Patient Protection and Affordable Care Act to improve the quality and efficiency of health care. EHR use has been touted for its potential to improve quality and efficiency. Based on the results of this study, implementation of CPOE functionalities varies significantly across hospital ownership, teaching status, and rural/urban location.*

Keywords — Electronic Health Record (EHR) Implementation

Introduction

Electronic Health Records (EHRs) have slowly become recognized as an important tool within the healthcare industry. EHRs are used by many healthcare professionals, from physicians to nurses to health information managers (HIM). EHRs help make the process of data entry and maintenance easier and more convenient. It is thought that by 2024 the EHRs will have reached their maximum

amount of facilities (Ford, 2006). Electronic health records (EHRs) have many benefits to offer the healthcare industry, even though some are still skeptical to adopt and implement the systems. Most drawbacks among individuals come from concerns about initial costs, maintenance costs, and temporary productivity reduction during training times. However, the majority of experts believe that EHRs will indeed have more benefits than drawbacks within an organization, especially when used in a "meaningful" way (Menachemi *et al.*, 2011). Understanding the patterns in which organizations are implementing EHRs and the characteristics of the organizations is of importance in determining how to shape policy to incentivize providers to adopt and implement EHR technology. The aim of this study is to investigate the relationship between three levels of computerized provider order entry (CPOE) and clinical decision support systems (CDS) implementation of functionalities and hospital structural characteristics.

Background and Importance

Structural factors, environmental factors, and interactions with other providers have been three main mechanisms that have been used to describe the diffusion (market acceptance) and adoption of new health technologies (McCullough, 2008). Hospital characteristics or structural factors can include hospital ownership/control (government-nonfederal, not-profit, for-profit), teaching status (academic, non-academic), hospital size (specific to region, location, and teaching status), and location (rural or urban). Mixed literature on the adoption and implementation of EHRs has created the need for studies that further investigate this area.

Hospitals ownership has been shown to have a mixed effect on HIT adoption decisions. McCullough (2008) found that ownership has no relationship with adoption decisions. In some studies certain application clusters are more likely to be adopted by for-profit hospitals (Zhang *et al.*, 2013), while for-profit were more likely to adopt clinical type applications (Burke *et al.*, 2002). Other studies have also shown that non-profit

hospitals are more likely to have EHR systems than for-profit, rather the implementation be with the CPOE or CDS (Furukawa, 2010). The decision to implement in non-profit hospitals could be the result of the size of the IT budget, which is often larger than for-profit (Fonkych & Taylor, 2005). Within a hospital, regardless of ownership, CPOE and CDS adoption are evaluated based on the benefit to the organization. Medical errors are a challenge within healthcare, and a way to reduce them is always a topic of interest. Within hospitals implementing EHR systems, CPOE use demonstrated a significance reduction in the rate of medical errors (Radley *et al.*, 2013). Additionally, CDS use has shown an increase in quality improvements (Jones *et al.*, 2010). Despite both CPOE and CDS documented improvements in quality of patient care, the implementation of EHR technologies is minimal and information on hospital ownership as a diffusion factor is mixed. The mixed results in the literature call for the need for further investigation in this area.

When a hospital is academic versus non-academic, some may think that it is more useful not to implement EHRs. This could be true because when teaching students, it is more useful for them to know how to perform tasks manually as well so that if in the instance the technology were to fail. In many academic hospitals, paper-based forms have a higher priority than electronic-based (Zandieh *et al.*, 2008). In some academic hospitals, mortality rates are an issue; however, when a highly commercial CPOE was implemented within a children's academic hospital, the mortality rate decreased by a statistically significant amount (Longhurst *et al.*, 2010). In non-academic hospitals, CDS shows to perform well and help integrate patient data easily (Cho *et al.*, 2010). In some instances in academic hospitals, CDS attributes among EHR systems showed no consistent increase in quality (Romano *et al.*, 2011). It is important that as researchers we investigate the adoption and implementation of the sub-functions of CPOE and CDS by teaching status to see if some hospitals are more likely to implement certain sub-functions over others.

Hospital location in either a rural or urban setting has also been a structural factor that is frequently examined. Rural hospitals have the tendency to be smaller in size and lacking the resources of their urban counterparts. The differences in resource availability and populations served have created a number of health disparities across geographic location. In a national survey, HIT adoption and use in primary care offices was not much difference across rural and urban locations (Singh *et al.*, 2011). Research on hospital

implementation found that rural hospitals seem to be behind urban hospitals in almost every aspect of "meaningful use," which provides monetary compensation to incentivize providers to implement and use select functionalities of EHRs (McCullough *et al.*, 2011). Other studies have found similar results; hospitals with rural designations have lower adoption of HIT than those in urban designations (Fonkych & Taylor, 2005; Jha *et al.*, 2011; Zhang *et al.*, 2013).

The aim of this study is to investigate the relationship between three levels of computerized provider order entry (CPOE) and clinical decision support systems (CDS) implementation of functionalities and hospital structural characteristics. By examining the five sub-functions of CPOE and the six of CDS, our results will add to the current literature in providing a more focused investigation of the implementation patterns of the sub-functions of the CPOE and CDS functionalities of EHRs. Additionally, results could provide clarification on findings of previous studies that reported mixed results on implementation by structural characteristics.

Methods

The 2010 American Hospital Association (AHA) Information Technology (IT) Supplement was merged with the 2010 Nationwide Inpatient Sample. The AHA-IT supplement surveys hospital's on their level of implementation of EHR functionalities. We examined two main categories of functionalities: CPOE and CDS. The two main functionalities were selected from those that aligned with government incentives for "meaningful use" of EHR technology. We examined the level of implementation of five sub-functions of CPOE (medications, laboratory tests, radiology tests, consultation requests, nursing orders) and six sub-functions of CDS (drug-allergy alerts, drug-drug interaction alerts, clinical guidelines, clinical reminders, drug-lab interaction alerts, drug dosing support). For each sub-function, hospitals respond with their level of implementation from 1-6 as shown in Table 1.

The study sample used a conservative estimate of implementation by focusing on those hospitals that had *fully* implemented the selected functions across *all* clinical units (Table 1, see Level 1). This conservative criterion is consistent with that used by Jha *et al.* (2010) in the examination of a *comprehensive* EHR. A comprehensive EHR includes *full* implementation of all 24 sub-functions across *all* clinical units. The sample included hospitals present in both datasets (n=347). Using SAS 9.2 software, bivariate analyses using chi-square significance tests were used to

determine if level of EHR implementation for five CPOE and six CDS functionalities varied by ownership, teaching status, and urban/rural location.

Conclusions

Bivariate analyses revealed significant ($p < 0.05$) relationships between level of implementation for four CDS functionalities (clinical guidelines, clinical reminders, drug allergy alerts, and drug-drug interaction alerts) for location. Significant relationships were also detected by implementation level of all CPOE and CDS functionalities for teaching status and only for the CPOE functionality nursing orders for profit, non-profit, and government owned. While EHR use, CPOE and CDE particularly, has been touted for the potential to improve quality and efficiency there seems to be low levels of implementation and use. Understanding how to motivate the adoption and implementation of EHRs by laggards is important for policymakers in order to determine which types of hospitals (based on structural factors) to target with incentives to adopt this technology. The government is one of the largest payers of healthcare and has a direct interest in some of the benefits that EHR use can yield.

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Tables & Figures

Table 1. Levels of EHR Implementation

Level used for analyses	Levels measured in AHA survey
3	(1) Fully implemented across all clinical units
2	(2) Fully implemented in at least one clinical unit
1	(3) Beginning to implement in at least one clinical unit
	(4) Have resources to implement in the next year
	(5) Do not have resources but considering implementing
	(6) Not in place and not considering implementing

Critiquing Fall Assessment Tools

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Abstract — *Providing a safe environment for acute care hospital patients can be challenging. Fortunately, there are many tools designed to assist the registered nurse (RN) in assessing and preventing the patient from the harm of falling. A fall is defined as when a patient goes from a higher plane to a lower plane (Bon Secours, 2013). A patient that falls cost on average \$4200 more than a patient that does not fall. The purpose of this evidence-based project was to compare two fall assessment tools and to determine if a more current, relevant nursing guideline should be established. The clinical question was “Does the use of the Hendrich II Fall Risk Model compared to the Conley Scale decrease the chance of falls in acute care patients?” One nursing guideline, one Level II randomized controlled trial, one Level III experimental study, and one Level V non-experimental study were obtained and critically analyzed in this project. Results were that a longitudinal randomized study is recommended to identify patient fall risk to include assessment of the patient’s cognitive status, elimination needs and gait/mobility scores.*

Keywords — accidental falls, Conley Scale, Hendrich II Risk Model

Introduction

Falls that occur in the hospital setting can cause many injuries including fractures, subdural hematomas, excessive bleeding, a loss of self-confidence in mobility and even death. The purpose of this evidence-based project was to examine the effectiveness and usability of the Hendrich II Fall Risk Model (HIIIFRM) compared with the Conley Fall Scale. The clinical question was, “Does the use of the Hendrich II Fall Risk Model compared to the Conley Scale decrease the chance of falls in acute care patients?”

Population: Acute Care Patients

Intervention: Hendrich II Fall Risk Assessment Tool

Comparison: Conley Scale

Outcome: Decrease in falls

Method

The objective of the evidence-based project was to examine the differences and outcomes between two popular falls assessment tools. To examine the pros and cons of both the Hendrich II Model and

Conley Scale, literature comprised of three different research articles along with a nursing practice guideline was analyzed. The first article, *Evaluating the use of a Targeted Multiple Intervention Strategy in Reducing Patient Falls in an Acute Care Hospital: A Randomized Controlled Trial* was used to examine the effectiveness in reducing the number of falls in an acute care hospital for patients identified as high-risk for falls using the Hendrich II Falls Risk Model (Ang, Mordiffi, and Wong, 2011). The second article analyzed, *Accidental Falls in Hospital Inpatients: Evaluation of Sensitivity and Specificity of Two Risk Assessment Tools*, compared the use of the Hendrich II Risk Model with the Conley Scale in the same sample of acute care hospital patients (Lovallo, Rolandi, Rossetti, and Lusignani, 2009). The third article, *Relationship Between Occurrence of Falls and Fall-Risk Scores in an Acute Care Setting Using the Hendrich II Fall Risk Model*, reported exactly how effective the Hendrich II Fall Risk Model was in patients diagnosed with diabetes mellitus, stroke, or heart failure and the relationship of these patients’ fall scores with the incidence of actually falling in an acute care setting (Swartzell, Fulton, and Friesth, 2013). The nursing practice guideline, *Bon Secours Health System Fall Prevention Policy, Adults*, addresses current fall prevention and assessment processes used in inpatient hospital areas (Bon Secours Health Systems, Inc, 2013).

Findings

Findings in the Nursing Research Literature

The literature search resulted in one nursing practice guideline and three articles that varied in the Levels of Evidence Hierarchy: one Level II randomized controlled trial, one Level III experimental study article, and one Level V non-experimental study. In all three articles, the size of the group had no influence over whether or not one fall risk assessment tool was better than the other one.

The first randomized controlled trial study, by Ang, Mordiff, and Wong (2011), used as the intervention the Hendrich II Fall Risk Assessment tool along with multiple interventions specific to

the patient identified as a fall risk ($n=910$). The control group ($n=912$) was assessed using the Hendrich II Fall Risk tool only. The rate of falls was greater in the group using only the Hendrich II Fall tool. This study concluded that one single assessment tool is not adequate to prevent falls (Ang, Mordiffi, & Wong).

The second article by Lovallo, Rolandi, Rossetti, & Lusignani (2010), reported a study of the comparison of the Conley Scale and the Hendrich II Risk Model by using them simultaneously with the same group of hospital inpatients. This observational study was carried out in a medical/surgical unit and a rehabilitation unit. One thousand, one hundred and forty-eight patients were assessed with both fall assessment tools, and in turn, the occurrence of actual falls were recorded and calculated. Of these 1148 patients, the Hendrich II Fall Model showed 426 to be at risk for falling; of these, 27 patients actually fell. The Conley Scale indicated that 576 of these patients were at risk for falling, with 41 patients actually falling. The Conley Scale was demonstrated to be a better tool among medical patients based on its high sensitivity. The study concluded that further clinical studies are warranted to decide whether each tool is appropriate for broad use among varied acute care hospital units (Lovallo, Rolandi, Rossetti, & Lusignani).

The third article, *Relationship Between Occurrence of Falls and Fall-Risk Scores in an Acute Care Setting Using the Hendrich II Fall Risk Model (HIIFRM)* (Swartzell, Fulton, and Friesth, 2013), reported a retrospective, descriptive, and correlational study to determine the relationship between the occurrence of a fall and the HIIFRM score. The study compared a random sample of patients with heart failure, diabetes, and stroke who fell during their hospital admission to a matched control group of patients who did not fall. For all cases combined, the HIIFRM score was related significantly to falling ($\chi^2=4.185$, $p=0.0412$). However, the instrument failed to identify 44% of patients who did fall as being at high risk for falling; having this high a percentage of patients not accurately scored causes a concern with patient safety. The study provided clinical examples as to why the HIIFRM is not always accurate and is inconsistent; for example, subjective assessment, nurse characteristics – education, years of experience, experience with a selected specialty population – and other individual and nursing unit-related factors. These examples indicate that it is not the most effective fall risk assessment tool (Swartzell, Fulton, and Friesth).

A nursing practice guideline from Bon Secours Health System was used after obtaining permission from Denise Campbell, Director of Nursing at Saint Francis Hospital, Greenville, SC. This guideline states the current policy: Patient falls are a threat to the quality of healthcare; therefore patients are assessed and reassessed for fall risk factors. If the patient is identified as being at risk, appropriate interventions will be implemented (Bon Secours Health System, 2013).

Conclusions

Based on the evidence from nursing research articles and the nursing practice guideline, the authors could not recommend using the Hendricks II or the Conley Model for fall assessment. The strength of the evidence was weak. The articles demonstrate that extraneous variables had influence over the outcome of the studies. These variables include the environment, the nurses' perception of the patients' mobility, assistance from the family, staffing, and the information provided by the patient and/or family. Results confirmed that more patients fell after being screened with the Hendrich II Model versus the Conley Model. Based on the size of the groups for each study there was no influence over whether or not one tool was better than the other one. The Conley Model appears to be the best tool to use to assess patient fall risk. However, further research using a longitudinal randomized study is suggested to identify patient fall risk to include assessment of the patient's cognitive status, elimination needs and gait/mobility scores. Based upon findings, revisions to the guidelines at Bon Secours Health System should be made to decrease overall falls and increase patient safety. A revised guideline would need to include consistent reassessment of each patient, especially after a new medication is started, if a patient falls, or if the patient is scored to have a high fall risk.

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Impact of Presentence Investigation Report Types and Gender on the Sentencing of Offenders

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Abstract — A presentence investigation report (PSIR) is conducted and presented to the judge by a probation officer. There are two major types of PSIRs: offender-based, which focuses on the person who committed the crime, and offense-based, which focuses on the crime itself. As of 1980, there has been a shift towards offense-based PSIRs which warrants research into potential effects. The current research evaluated the effect of the PSIR type (offender-based or offense-based), the type of crime, and the gender of the offender on sentencing. A significant main effect of crime type and of PSIR type was found. A significant interaction between crime type and PSIR type was also found. The results of the current study can be used to promote awareness of potential sentencing biases in the criminal justice field and to produce more effective PSIRs.

Keywords — offender, offense, gender, crime, sentence

Introduction

Prior to sentencing, a presentence investigation report (PSIR) is conducted and presented to the judge by a probation officer. There are two major types of PSIRs: offender-based PSIRs and offense-based PSIRs. Historically, offender-based PSIRs were more prevalent, but since 1980, there has been a shift towards offense-based PSIRs. The content of offender-based PSIRs, focuses on the offender's character, external influences, potential causes for his/her behavior and whether there is potential for change. In contrast, the content of offense-based PSIRs focuses on details of the crime committed, the impact on the victim, the offender's criminal history, drug use, employment and family ties (Alarid & del Carmen, 2011). Macallair (2008) points out that, as sentencing has become more punitive, the PSIR has become more focused on the crime committed rather than on the individual that committed the crime. When considering that the PSIR is a critical component in a judge's sentencing decision, a change in the PSIR content is justification for the investigation of PSIR type and its impact on sentencing.

An important aspect of the sentencing process, in addition to the PSIRs, is gender disparity. According to Alarid and del Carmen (2011), the offender population is made up of three times more males than females. Studies have indicated that

there is a 60 percent sentencing length gap between the genders (Starr, 2012), with females being heavily favored during the pretrial release and sentencing phases (Daly, 1987). The sentencing phases of property and drug offenses result in females having less of a chance to receive prison sentences and more chances of receiving lighter sentences than males. For example, females are also more likely to receive shorter prison sentences for violent offenses than males (Fernando Rodriguez, Curry & Lee, 2006). Overall, research supports that participants sentence male offenders harsher than female offenders.

Another factor that affects sentencing is the perceived severity of a crime. Are crimes that are classified as being of the same severity sentenced the same? For example, the South Carolina Legislative Services Agency (2014) has indicated that both the charge of shoplifting merchandise valued between \$2,000 and \$10,000 and the charge of involuntary manslaughter are classified as Class F felonies with a maximum sentence of 5 years in prison. Research has shown that, although the public may not always agree with how a judge sentences (Roberts & Doob, 1990), there is a general consensus that some crimes are perceived as more severe than others (Ramshand, MacDonald, Haviland, & Morral, 2009). With this misperception of severity, offenses within the same class may be sentenced differently.

The results of the current study are anticipated to reveal an effect of PSIR type on sentencing, an effect of offender gender on sentencing, an effect of crime type on sentencing, and an interaction between PSIR and offender gender. It is hypothesized that offender-based PSIRs will result in longer sentences than offense-based PSIRs, and that male offenders will be sentenced to longer terms than female offenders. It is also hypothesized that for the offense-based PSIRs there will be a larger sentencing gap between male and female offenders than for the offender-based PSIRs. Lastly, it is hypothesized that there will be longer sentences imposed for the charge of involuntary manslaughter than for the charge of shoplifting merchandise valued between \$2,000 and \$10,000.

Methods

Participants

Participants included 205 college students from the University of South Carolina Upstate that were voluntarily participating in research for class credit, extra credit or experience.

Materials

Two criminal cases were developed by the researcher; one contained a charge of shoplifting merchandise valued more than \$2,000 but less than \$10,000 and the other contained a charge of involuntary manslaughter. Each case was manipulated to fit the format of both an offender-based PSIR and an offense-based PSIR based the format developed by Macallair (2008). Also, a neutral PSIR with only the offender's name, basic information and charge was designed as the control. These three scenarios were then assigned both a male and female offender, for a total of twelve fully crossed scenarios.

Procedures

The participants were randomly assigned to one of the three PSIR conditions; each participant was instructed to impose a sentence on an offender charged with shoplifting merchandise valued between \$2,000 and \$10,000 and an offender charged with involuntary manslaughter, both of which were of the same gender. After reading and verbally agreeing to the consent form, participants were instructed to read the PSIR and then select the sentence they would impose on the offender described in the case description; the same procedure was used for both PSIRs. Following the completion of the sentencing, the participants were asked to provide personal demographic information and were debriefed.

Results

A 2 (Crime Type: involuntary manslaughter, shoplifting) x 2 (Offender Gender: male, female) x 3 (PSIR Type: neutral, offender-based, offense-based) mixed factorial ANOVA was conducted. A significant main effect of crime type was found, $F(1, 198) = 135.58, p < .001$, with the involuntary manslaughter crimes ($M = 2.98, SEM = .091$) being imposed with longer sentences than the shoplifting crimes ($M = 1.75, SEM = .001$). A significant main effect of PSIR type was found, $F(2, 198) = 16.241, p < .001$, with the neutral PSIRs ($M = 2.785, SEM = .1$) being imposed with longer sentences than the offender PSIRs ($M = 1.985, SEM = .1, p < .001$) and the offense PSIRs ($M = 2.328, SEM = .094, p = .001$). The offense PSIRs were imposed with longer sentences than the offender PSIRs ($p = .013$). A

non-significant main effect of offender gender was found, $F(1, 198) = 1.579, p = .210$, with males ($M = 2.437, SEM = .08$) being imposed with longer sentences than females ($M = 2.295, SEM = .079$).

A significant interaction between crime type and PSIR type was found, $F(2, 198) = 3.911, p = .022$. For the shoplifting crimes, the neutral PSIRs were imposed with significantly longer sentences than the offender PSIRs ($p = .015$). For the involuntary manslaughter crimes, all the PSIRs were imposed with significantly different sentences, with neutral PSIRs being imposed with the longest sentences, followed by the offense PSIRs. The offender PSIRs were imposed with the shortest sentences. No other effects reached significance.

Conclusions

As predicted, the type of Presentence Investigation Report has an effect on the sentencing of offenders. The participants imposed longer sentences on the offenders in the offense-based PSIRs than the offenders in the offender-based PSIRs. When focusing on the offense and the sentence range, a judge may be more inclined to sentence closer to the maximum recommendation. Whereas looking at the offender's background and the potential to change, a judge may be more inclined to impose probation or recommend a rehabilitation program.

Although it was predicted that males would be imposed with longer sentences and that there would be an interaction between offender gender and PSIR type, the data from this research did not support the hypothesis. However, current literature indicates that there typically is an effect of gender on sentencing. In fact, upon further inspection, the males were imposed significantly longer sentences than the females in the offense-based PSIR. Since the PSIRs used today are offense-based, this could explain why most of recent data supports the notion of gender disparity.

In regards to the type of crime, the participants supported the idea that the misperception of crime severity affects the sentencing process. Participants focused on the difference between the death of a human and the theft of an inanimate object, imposing harsher punishments for equally classed offenses. The participants sentenced each offender that committed involuntary manslaughter drastically different in all types of PSIR. For the shoplifting offender, the participants' only sentencing difference was found between the neutral and the offender-based PSIR. Crimes that are perceived as more severe could potentially be

sentenced more harshly because of the current shift toward offender-based PSIRs.

In going forward, it is important to note that research has revealed a correlation between recidivism and the amount of incarceration time served in prison. Those that serve time in prison are more likely to recidivate than those that serve time in the community (Alarid & del Carmen, 2011). Therefore, it is essential to ensure that offenders are evaluated fairly and accurately by the judicial system. The results of the current study provide insight into the notion that PSIR type, gender of offender, and the type of crime impacts the judicial sentencing. Such information should be used to promote awareness of these potential sentencing biases within the criminal justice field and to produce more effective PSIRs.

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The Role of Intent in Deception

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Abstract — Deception paradigms typically require participants to actively deceive using forced response scenarios that are often difficult to characterize with regards to external validity. The current study attempts to examine a different aspect of deception by focusing on how individuals react to stories of deception by others. A total of 120 participants were studied across two experiments in which participants were initially primed with intentionally misleading and truthful (Experiment 1) or intentionally misleading and unintentionally misleading (Experiment 2) stories. Participants then read a follow-up story that used the same critical phrase found in the initial story, but did so in an ambiguous context with regards to event. Reading times were then measured for the story line that disambiguated the intent of the critical phrase as intentionally misleading. The results of Experiment 1 showed that participants read the disambiguation line faster after being exposed to an intentionally misleading passage. Results of Experiment 2 showed that participants again read the disambiguation line faster following an intentionally misleading passage, though the difference was smaller than in Experiment 1. Experiment 1 established that being primed with a misleading statement does lead to faster reading times, which allowed researchers to draw potential conclusions with regards to intent versus congruency using this paradigm in a follow-up study. Experiment 2 demonstrated that the results found in Experiment 1 are consistent, even when compared against a semantically similar prime.

Keywords — Deception, intent, priming

Introduction

The current literature is mixed on how to define a deception. Some theorize that the manipulation of a truth from the truth's original form constitutes a deception (Johnson, Henkell, Simon & Zhu, 2008). Others have defined deception as requiring intent to mislead from what the speaker believes is accurate (Kraphol & Sturm, 2002). Typical deception paradigms in the literature usually involve participants being actively directed to lie in some manner, either to defeat a lie detection test (e.g. Davatzikos, et al., 2005; Kozel, et al., 2005) or just to respond in a way counter to the personal knowledge they possess (e.g. Vendemia et al., 2005; Walczyk et al., 2003; Walczyk et al., 2005). However, these paradigms are difficult to extrapolate to "real world" scenarios. The goal of the current study is to attempt to

examine how individuals response to deception in others, with a particular emphasis on understanding if there is a difference in how intentionally misleading and unintentionally misleading information are perceived.

If intent is considered a critical component to our natural definition of deception then if somebody accidentally misleads us, we would not consider it a deception. That is to say that if intent is critical then we may process intentionally deceptive information differently from information that was not meant to be deceptive but was in fact incorrect information. Given that some have claimed social cognition to be like a default state in the brain (Mitchell, 2008) and we consider other's intentions in various other aspects, such as in judgments, theory of mind, social decision, etc., it seems reasonable to think that intent matters in deception as well. However, there is little evidence that indicates if we naturally consider intentionally misleading information to be different than unintentionally misleading information.

Priming by short stories has proven to be a feasible method in studying the topics of sarcasm and perception. Experiments have used every day phrases that otherwise would have been interpreted sincerely, similar to how generic phrases would generally be interpreted truthfully. Klin, Ralano, & Weingartner (2007) show salient repeated phrases benefit across different stories with different characters by using self-paced by phrase reading tasks. Participants were primed to interpret a generic phrase sarcastically in a Story A. Then when they saw the same phrase again in an ambiguous context in a Story B, participants were faster to read a sarcastic-consistent disambiguous line, a line which informed readers to interpret the repeated phrase sarcastically, compared to participants primed with a sincere version of Story A. Klin, Drumm, & Ralano (2009) found that this effect was robust. Meaning effects can survive between two different stories, Story A and Story B, even with an intervening filler story.

Klin and Drumm (2010) have proposed that the reason for the effect in reading is that readers have a representation of the text that goes beyond just the actual words of the text. They theorize that cognition is grounded in perception and bodily

action. In order to understand the point of view of the character the reader may simulate the character's perceptual details, such as the tone of a sarcastic phrase. In the study, participants were primed with a Story A in which the protagonist either heard or read the to-be-repeated phrase. In Story B, a different protagonist experienced the repeated phrase in the other modality. For example, if in Story A the protagonist read the to-be-repeated phrase then in Story B the protagonist heard the phrase. The meaning effects were eliminated. Only if modalities are kept the same do participants benefit in the interpretation of a repeated ambiguous line. From the results of this study the authors concluded that that imagining a character experiencing a scenario is cognitively similar to actual experiencing the scenario. If this is the case, then it is logical that readers also identify with the perceived intent of a character to deceive.

According to the theory, when participants are primed to interpret a generic phrase as an intentional deception, they should be faster to read an intentionally misleading disambiguation line when they see that same phrase again in a different story. Furthermore, if participants are primed to interpret a generic phrase as a truthful statement, they should be slower to read an intentionally misleading disambiguation line when they see that same phrase again in a different story. In addition, if intent is a large factor in defining an intention, as opposed to the simple accuracy of the information, then if participants are primed to interpret a generic phrase as an unintentional deception, they should be slower to read an intentionally misleading disambiguation line when they see that same phrase again in a different story. In other words, if intent is as critical as some theorist, such as Krapohl and Sturm (2002) assume it to be, the results of priming for unintentional deceptions should behave more like priming for truth and less like priming for an intentional deception. This study attempts to prove the assumption of intent as crucial in defining a deception by a self-paced by sentence reading task similar to that of Klin and colleagues.

Experiment 1

Participants

For experiment 1, 50 undergraduates at the University of South Carolina-Upstate participated, with the majority having been recruited from introductory psychology courses. Of the 50, 7 were excluded from data analysis because they were self-reported non-native English speakers or because they achieved below 70% accuracy. Therefore, our

analyses were based on the data from 43 participants, 8 of whom were male.

Materials

There were 20 experimental items, with each item consisting of a pair of unrelated stories, Story A and Story B. There were two versions of Story A: intentionally misleading and truthful. Both versions began with an introduction that described an interaction between two characters.

In the intentionally misleading version of story A, one character intentionally misleads another. Leading into the deception was the storyline, or rather, critical information, followed by a critical phrase (e.g., I already read it), which was to be repeated in story B. The critical phrase was written so that if it appeared in isolation, without context, it would be ambiguous. However, to ensure that readers interpreted this phrase to have misleading intentions, we had a sentence precede the critical phrase that clearly stated intent (e.g., Betty had truly not even started the book. Betty replied, "I already read it").

In the truthful version of story A, no misleading information was provided prior or following the critical phrase. The critical phrase was different than the critical phrase found in the intentionally misleading version of story A. It too was repeated in story B (e.g., I'll call you tomorrow). The truthful version of story A was completely truthful in its entirety with no room for ambiguity. The critical information sections from Story A were matched for length across the two versions. Finally, the conclusion provided a two-sentence story ending.

Story B followed the same protocol across versions. In addition, story B was semantically unrelated to story A; the two stories did not share a story line or characters. The introduction of story B described the interaction between two characters. This was followed by the critical phrase, which was identical to the critical phrase of Story A. However, the phrase was presented in a neutral context and was therefore ambiguous; it was unclear until after the critical phrase whether deception was present. This critical phrase was followed by a disambiguation line that placed intent into the critical phrase (e.g., "We're all out of it" followed by, the store truly was not out of it). This served to ensure that the reader did not read intent into the critical phrase until after reading the critical phrase. Note that for each of the 20 experimental items, a different critical information section was used.

The dependent measure was the reading time taken when reading the critical phrase of story B. Therefore assuming that a time discrepancy exists

between those primed with the truthful and intentionally deception versions of story A.

Procedure

The participants were tested individually and were given no time limit. They were informed that they would be answering one “yes” or “no” question after each individual story. The items were presented on a computer monitor. The participants controlled the presentation of the text with the spacebar of the keyboard. Each key press caused the current line of text to be erased and the next line to be presented. Between stories, the phrase “End of Story” appeared at the center of the monitor. Importantly, this phrase appeared between Story A and Story B in all of the experimental items. That is, readers had no reason to treat Story A and Story B as part of the same experimental trial.

Immediately after the last line of Stories A and B, a key press cued a comprehensive question about each respective story. The question was always in a “yes” or “no” format. The participants were given the opportunity to take breaks between stories however no participant took advantage of the opportunity. At the start of the experiment participants were given two practice trials to acclimate to the testing procedure.

Results

A repeated samples t-test was conducted to determine if there was a significant difference between the reading times of the disambiguation lines for story B. A significant difference was found, such that $t(42) = 7.14$, $p = .000$. On average participants read the disambiguation line faster after being exposed to an intentionally misleading Story A ($M = 1870.72$, $SD = 481.62$) than after being exposed to a completely truthful Story A ($M = 2190.37$, $SD = 577.79$). This is a difference of 319.65 ms.

Experiment 2

Participants

For experiment II, 70 undergraduates at the University of South Carolina-Upstate participated per department requirement. Of the 70, 10 were excluded from data analysis because they were self-reported non-native English speakers or because they achieved below 70% accuracy. Therefore, our analyses were based on the data from 60 participants, 24 of whom were male.

Materials

We used 20 experimental items, similar to those in experiment I. In this experiment, there were two versions of story A: intentionally and

unintentionally misleading. The unintentionally misleading version involved one character unintentionally deceiving another. Simply meaning that the critical phrase was preceded by sentences that ensured the reader knew no intentional deception was present. Intentionally misleading stories were presented similarly to those presented in experiment 1.

Story B followed the same format as it did in Experiment I.

Procedure

The procedure was identical to that in Experiment I.

Results

A repeated samples t-test was conducted to determine if there was a significant difference between the reading times of the disambiguation lines for the story B. A significant difference was found, such that $t(60) = 2.12$, $p = .038$

On average participants read the disambiguation line faster after being exposed to an intentionally misleading Story A ($M = 2052.97$, $SD = 472.43$) than after being exposed to a unintentionally misleading Story A ($M = 2128.12$, $SD = 496.38$). This is a difference of only 75.15 ms, which is a much smaller difference than that found in the first experiment, though still a significant result.

Conclusions

The results of these studies support the original findings of Klin and colleagues that character intent can be primed from one set of characters to a different set. In addition, these results also indicate that we can prime a reader to read an otherwise innocuous statement as intentionally misleading. This result was consistent even when the participants were primed with semantically similar information that differed only in the intent of the speaker in the story. This result provides evidence that individuals do perceive a difference in the intent of a speaker as a key component in whether a statement is deceptive.

The findings from this study support a theoretical definition of deception that specifically defines the intent of the speaker. It is arguable that even unintentionally misleading information is still information that varies in form from the actual “truth” or factual knowledge of a situation. This idea is supported by the fact that the separation between mean reaction times was smaller for experiment 2 than it was for experiment 1. The findings that significant reading time difference still existed in experiment 2 supports the idea that

even though the information resulted in a similar outcome, participants still distinguished an important difference in the intent of the speaker. Furthermore this difference was strong enough that it primed them to expect a similar intent from a different character who used the same phrase in a different scenario.

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Brony Fans vs. Non Fans: Comparing Individual Differences and Beliefs

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Abstract — *The latest version of My Little Pony: Friendship is Magic (MLP:FiM) has attracted young adult males in addition to the series' targeted audience. A fandom has evolved based on the series for males who label themselves Bronies (bro-ponies). This study was conducted to compare male college students (Brony vs. Non-Brony) on personality traits, use of the internet, time viewing cartoons, time spent playing video games, and where they found meaning in their lives.*

Keywords — Brony, non-Brony, fandom, individual differences

Introduction

In the Fall of 2010 a new version of the cartoon series *My Little Pony: Friendship is Magic* (MLP:FiM) was released for a viewing audience of prepubescent females. This show also attracted a new group of fans, Bronies (bro; ponies), males aged 13-30 who began viewing the series, writing fiction, poetry and music centered around it (Edwards, Griffin, & Redden, 2014). The fans began to connect and share their creations and interest through the Internet, resulting in several websites that grew around the cartoon. Authors of the Brony Study (Edwards et al., 2014) have questionnaire responses from over 14,000 fans, and posts on various Brony websites estimate the Brony fandom at over 40,000 fans. However, the question remains: "Who are Brony fans" and "What makes them unique?" Counseling psychologists (Lent, 2004) suggest that in order to be well adjusted, people need to have meaning in their lives. Stegar Frazier, Oishi, and Kaler (2006) have developed a questionnaire to assess the amount of meaning that is present in a person's life and the degree to which he is searching for meaning. Research (Edwards et al., 2014) found that Brony fans said finding guidance was one of the important factors that drew them to the fandom. However, the MLQ questionnaire did not include achieving meaning in one's life from a fandom as a question. The purpose of the current research was two-fold: 1) to include a purpose of life assessment that included being a member of a fandom as one area and 2) to determine whether college students who were fans of MLP:FiM differed from college

students who were not fans on various measures. It was hoped that this information would help in better understanding the Brony phenomenon.

Method

Participants, Materials, and Procedures

Participants were male college students who either were or were not members of the Brony fandom ($N = 375$). Those participants who were not members of the Brony fandom ($n = 139$; $M_{\text{age}} = 19.78$; ranged 16-27 years of age), non-fans, were members of psychology classes at a small southeastern university and completed the online Brony questionnaire prior to the start of a larger experiment. Participants who were members of the Brony fandom, recruited using Brony websites, were an equivalently matched subset of Brony fans ($N = 236$; $M_{\text{age}} = 19.52$; ranged 16-26 years of age) whom completed the online survey as part of a larger Brony experiment. The subset of Brony fans were matched to the non-fans on education level (i.e., college students) and age. The online survey included questions assessing fan interest and level of involvement in the fandom and amount of time using the Internet, playing video games and watching cartoons. It assessed personality traits using the Big Five Personality Scale: Short Form (Gosling, Rentfrow, & Swann, 2003) and the Meaning of Life Questionnaire (Steger et al., 2006). Finally, the survey assessed ratings of degree of importance of six areas that give life purpose (e.g., belonging to a fandom, being in a relationship, or planning future goals).

Results and Discussion

Separate independent t-tests were conducted on each measure. Following the Bonferroni correction method, only results that reached a $p < .001$ level were considered significant.

Fan Interest and Involvement and Number of Hours on the Internet, Playing Video Games or Watching Cartoons.

There were no differences between the two groups on fan interest; a measure of how avid a fan

one was or on the number of fan groups one was involved in. This indicated that members of the Brony fandom join as many fan groups as other college students and are just as avid in their involvement. Although Brony participants were no more likely to be joiners than non-Brony participants, they were significantly more likely to spend time on the internet ($t(368) = 10.10, p < .001; R^2 = .22$); in fact Brony participants spent twice as much, almost 5 hours a day on the internet (34 hours per week) versus 2 hours a day for non-Brony participants. It appears that our Brony participants were more “internet-connected” than our non-Brony participants. Interestingly, there were no significant differences between our fan and non-fan groups in terms of the number hours they spent playing video games or watching cartoons; both groups spent an average of seven hours a week doing each activity. Even though, our non-Brony participants may not have been watching MLP:FiM, they were watching cartoons of some nature (see Table 1 and Figure 1).

Personality Measures.

On the Big Five Short Form (BFPS) personality measure of *Introversion-Extroversion* ($\alpha = .73$), the results indicated that Brony participants were more introverted than non-Brony participants ($t(348) = 6.20, p < .001, R^2 = .10; M = 8.46, SD = 3.26, M = 6.42, SD = 2.63$, respectively). On the *Conscientiousness* ($\alpha = .51$) measure results indicated that Brony participants were less conscientious than non-Brony participants ($t(346) = 5.50, p < .001, R^2 = .20; M = 9.02, SD = 2.72, M = 10.57, SD = 2.28$, respectively). On the *Meaning of Life Questionnaire* (MLQ) the MLQ-presence subscale ($\alpha = .88$) that assessed the extent to which participants endorsed items such as “I understand my life’s meaning,” there was a significant difference between Brony and non-Brony participants ($t(339) = 5.10, p < .001; R^2 = .07$). Brony participants indicated they were significantly lower in terms of understanding the purpose of their lives at the present time compared to the non-Brony participants in our study and in terms of college students in general (study one; Steger, Kashdan, Sullivan, & Lorentz, 2008;). Although there was also a significant difference between Brony and non-Brony participants ($t(336) = 3.36, p < .001; R^2 = .03$) on their tendency to search for meaning in their lives (*MLQ—Search*, $\alpha = .88$), their mean scores were only one point different (lower or higher for Brony versus non-Brony participants, respectively) from the average score for participants from the other studies (e.g., Steger et al., 2008). Table 2 and Figure 2 summarized these results.

Meaning and purpose questions.

There were significant differences between Brony and non-Brony participants on only three of the six questions assessing the degree to which various areas gave their lives meaning, therefore, we conducted a 2 (fan: Brony vs. non-Brony) x 3 (meaning: fandoms vs. relationships vs. future goals) repeated measures ANOVA, where fan group was a between-subjects variable and gave purpose or meaning to life was a within-subjects variable. As can be seen in Table 3 and Figure 3, a Fan Group x Meaning interaction ($F(2, 670) = 26.10, p < .001; \eta^2 = .05$) indicated that Brony participants found more meaning from being a member of a fandom than non-Brony participants did, but non-Brony participants found more meaning from their personal relationships and future goals than Brony participants did.

Conclusions

We started our study with the questions “Who are Brony fans” and “What makes them unique?” Our Brony fans are a group of young men who are more introverted and less conscientious (conventional) than their non-Brony counterparts and who spend an inordinate amount of time on the Internet. However, they are no more neurotic, agreeable, open to new experiences, or curious than their non-Brony counterparts, and interestingly were as avid about their fandom as their non-Brony counterparts were about theirs. However, it appears that Brony fans find more meaning from their fandom and less from personal relationships with friends and family or from future goals than their counterparts. This finding is consistent with the MLQ results that showed that Brony fans have lower meaning in their lives and scored lower in their interest to search for meaning at this time. What can members of the Brony fandom learn from this research? It appears Bronies are essentially typical college students who are internet-connected and who have an avid interest in a fandom that is a stereotypical and internet-based and they draw an important part of their meaning in life from it. One limitation of this study is that it just looked at college student Brony and non-Brony participants, because the Brony fandom includes fans who are younger and older than college aged students, future research should look at comparisons for these groups.

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Tables & Figures

Table 1. The means (and standard deviations) for number of hours spent on the internet, playing video games and watching cartoons for Brony and non-Brony participants.

	NUMBER OF HOURS		
	Internet	Video Games	Cartoons
	M(SD)	M(SD)	M(SD)
BRONY	35.35(20.93)	14.5(14.41)	7.58(9.87)
NON-BRONY	14.42(13.06)	6.5(8.82)	6.32(9.81)

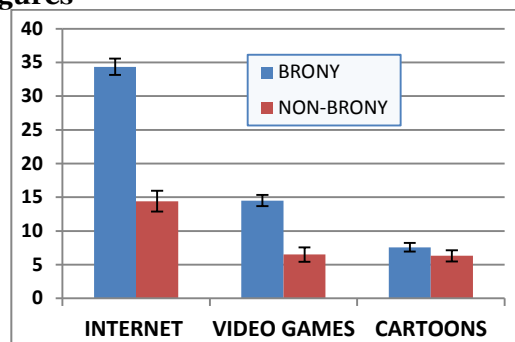


Figure 1. Number of hours spent on the internet, playing video games, and watching cartoons for Brony and non-Brony participant.

Table 2. The means (standard deviations) for the subscales of the Meaning of Life Questionnaire for Brony and non-Brony participants.

	MEANING OF LIFE QUESTIONIRE	
	Presence (5-35)	Search (5-35)
	M(SD)	M(SD)
BRONY	20.85(7.4)	22.88(6.95)
NON-BRONY	24.55(5.08)	25.31(5.87)
AVERAGE*	24(5.6)	24(6.2)

*Scores from Steger, Kashdan, Sullivan, and Lorentz (2008) study 1.

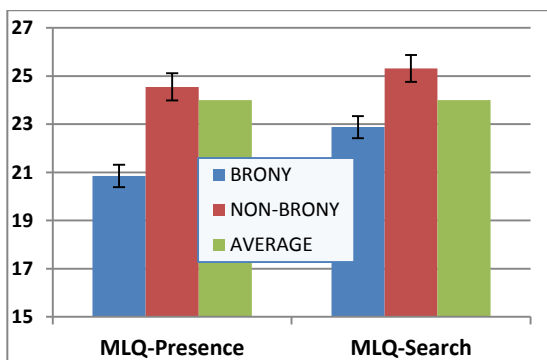


Figure 2. Means (and standard errors of measurement) for the subscales of presence and search from the Meaning of Life Questionnaire.

Table 3. Fan Group x Meaning or Purpose in Life interaction.

	MEANING OR PURPOSE IN LIFE		
	Fandom	Relationships	Future Goals
	M(SD)	M(SD)	M(SD)
BRONY	3(1.06)	3.66(1.08)	3.9(1.04)
NON-BRONY	2.64(1.2)	4.26(.76)	4.43(.81)

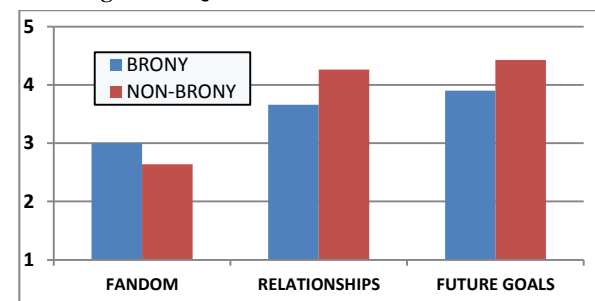


Figure 3. Fan Group x Meaning or Purpose in Life Interaction.

Finding Meaning within a Fandom: Not all Fans are Alike

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Abstract — Recent research has shown that the a-stereotypic Brony fandom differs from non-fans on personality and meaning of life variables. However, other research has shown that the Brony fandom is made of different subgroups of fans. This study was conducted to compare different sub-types of Bronies on the Big Five personality traits, trait curiosity and Absorption, and their search for meaning and presence of meaning in their life. Numerous significant differences existed and are discussed within the context of the Brony typology model and the current meaning of life research.

Keywords — Brony, fandom, personality, meaning of life

Introduction

Fandoms are groups of individuals who share common interests in areas such as TV programs (e.g., *The Bachelor*), sports teams (e.g., Seattle Seahawks), or cartoons series (e.g., *My Little Pony: Friendship is Magic*). In the past, researchers have found that these communities of interests were limited by geographic factors; however, technology, such as the internet, has allowed fans the opportunity to connect to others who are geographically distance (Obst, Zinkiewicz, & Smith, 2002). One fandom that fits this model is the Brony fandom; Bro-pony; Bonies. This fandom is comprised of males (aged 13-30) who discovered through international internet chat rooms that they enjoyed watching an age and gender a-stereotypic cartoon originally designed for prepubescent girls—*My Little Pony: Friendship is Magic*, MLP:FiM. A recent study (Langley, Griffin, Edwards, Chadborn, & Redden, 2014) found that the Brony Fandom displayed higher levels of Introversion, lower Conscientiousness and a significantly lower level of the Precedence of Meaning as well as the Search for Meaning when compared to a group of non-Brony fans. These findings were somewhat surprising since many of the Brony fans report that finding guidance is one of the important factors that first drew them to and continue to be motivate their involvement in the fandom (Edwards, Chadborn, Griffin, & Redden, 2014). One possible explanation for this discrepancy is that not all individuals within the fan community (fandom) are alike with

respect to their levels of search for and presence of meaning in life. It is possible that subgroups of fans may display both higher and or lower scores on these measures. An earlier study on this unusual and atypical fandom found that the fans could be categorized into one of the five Brony Fan Types based upon a 2x2 Dimensional model: the dimensions were 1) whether they sought guidance to confront life's demands and 2) whether they Self-Disclosed their involvement in the fandom. In addition, this research point out this Self-Disclosure dimension was strongly related to the presence of the personality trait of Introversion-Extroversion (Edwards, Griffin, Chadborn & Redden, 2014). The purpose of the present study was to look for the importance of the presence and the search for meaning within the Brony fandom, specifically to investigate whether the patterns of the search and presence differ based upon the Fan Typology.

Methods

Participants, Material and Procedure

Participants, contacted through popular Brony websites (e.g., www.equestriadaily.com) were male members of the Brony fandom ($N=2528$; $M_{age} = 21.1$, $sd=4.6$; range 16-40) who completed an online survey that included the Brony Typology Item (Edwards et al., 2014), the Curiosity and Exploration Inventory (CEI), the Big Five Personality Scale: Short Form (BFPS) and the Meaning of Life Questionnaire (MLQ). Participants were classified into one of five Brony types based on their answers to the Brony Typology Item. In order to ensure a more equal distribution of cell numbers a random sample of subjects, matched for Age, were drawn from within the larger cell numbers (Social, Secret and Mixed) to match up more closely with the groups with smaller cell sizes (Hipster and Hidden). This procedure resulted in a sample size of 763 subjects for the five groups: Social ($n = 154$), Secret ($n = 155$), Mixed ($n = 153$), Hipster ($n = 152$), and Hidden ($n = 149$).

Results

A series of one-way ANOVAs were conducted to compare the five Bronies Type groups on the Personality and Meaning of Life variables. These analyses revealed significant differences between the Brony Types on Extroversion ($\alpha=.76$, $F(4,758)= 113.00$, $p<.001$) and Neuroticism ($\alpha=.60$, $F(4,754)= 7.24$, $p<.001$), but not Conscientiousness (Table 1 and Figure 1). Tukey HSD tests were used to clarify the differences between the Brony Types. The Social and Hipster Bronies were more extroverted; the Secret and Hidden more introverted. With respect to Neuroticism the Secret and the Hidden are higher and Social and Hipster lowest. In addition, significant differences existed in Trait Curiosity ($\alpha=.69$, $F(4,750)= 18.71$, $p<.001$) and Absorption scores ($\alpha=.64$, $F(4,756)= 10.74$, $p<.001$), such as the Social ($M=22.09$, $sd=3.55$) and Hipster Bronies ($M=21.48$, $sd=3.93$) showed a higher level of curiosity and the Hidden Bronies ($M=18.55$, $sd=3.81$) a lower level. For Absorption the Social Bronies were higher than the other four groups. With respect of Meaning of Life there was a significant difference in both the Presence of Meaning ($\alpha=.90$, $F(4,731)= 7.67$, $p<.001$) and Search for Meaning ($\alpha=.91$, $F(4,726)= 9.98$, $p<.001$) between the Brony Types. See table 1 and figure 2. A review of these result show that Social and Secret are higher on search while Social and Hipster Bronies are higher on presence.

Conclusions and Discussion

The study results show significant differences between types of Bronies on Extroversion, and Neuroticism indicating that some Bronies (Social and Hipster) were extroverted, while others (Secret and Hidden) were more introverted. These results support the findings of Edwards *et al.*, 2014 that the personality trait of Introversion/ Extraversion is strongly associated with the Disclosure dimension of the Brony Typology model. Furthermore, the Neuroticism scores point to possible difference with respect to anxiety and psychological well being within the fandom such that Hidden and Secret Bronies may display higher levels of anxiety and psychological distress. No differences were found between the five groups on the personality dimension of Conscientiousness. Coupled with the results of Langley *et al.*, 2014, this finding points to a consistent, across the fandom, tendency to not adhere to social convention and/or stereotypes. This finding may help to explain how these young adult males overcome the double stereotype of Age and Gender in order to become

member of the fandom. With respect to Trait Curiosity the Social and Hipster Bronies scored higher and Hidden lowest, and for Absorption, only the Social Bronies were higher. These results raise the possibility that the Disclosure dimension of the Brony Typology model is related not only Introversion/Extraversion but also to a higher level of curiosity. All of these personality results support an argument that a simple comparison of fan groups to non-fan groups may overlook important individual differences that exist within a fandom. On the Meaning of Life variables the Social and Secret Bronies were Highest on Search, while the Social and Hipster Bronies score Highest on Presence. These findings provide further validation for the Brony Typology model and indication that the Presence of Meaning (having a clear sense of meaning in one's life) maybe strongly associated with the Disclosure dimension of the model (along with Extroversion and trait Curiosity), while the Search for Meaning (being engaged in an ongoing search for meaning) maybe strongly associated with the Guidance dimension of the Brony Typology model. Furthermore, the patterns created by the group scores on presence and search (Figure 2) fit with patterns discussed by Steger *et al.*, 2008 in their review of current conceptual models for the relationship between search and presence of meaning. In particular the patterns displayed by Social, Mixed and Hidden Bronies fit with predictions made by Frankel's conceptual model where search for life meaning leads to the presence of meaning. The patterns displayed by Secret and Hipster Bronies fits with predictions made by a competing conceptual model where the level of presence of meaning lead to the search for meaning.

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Tables & Figures

Table 1: Means and Standard Deviations for the Big Five Personality Scores(BFPS) and the Meaning of Life Questionnaire (MLQ)

BRONY TYPES	BIG FIVE PERSONALITY SCALE (BFPS)		MEANING OF LIFE QUESTIONNAIRE (MLQ)	
	Extraversion	Neuroticism	Presence	Search
	Range (2-14) M(SD)	Range (2-14) M(SD)	Range M(SD)	Range M(SD)
Social	9.29(2.93)	5.85(2.77)	22.75(7.35)	23.49(7.48)
Secret	4.82(2.21)	6.45(2.61)	20.39(7.44)	23.00(7.01)
Mixed	5.97(2.91)	5.83(2.81)	20.35(7.77)	21.55(7.76)
Hipster	8.73(3.14)	5.25(2.75)	22.69(8.18)	18.84(7.93)
Hidden	4.06(2.19)	6.83(2.93)	19.77(8.06)	20.45(7.54)

Figure 1: Brony Types by Personality Variables

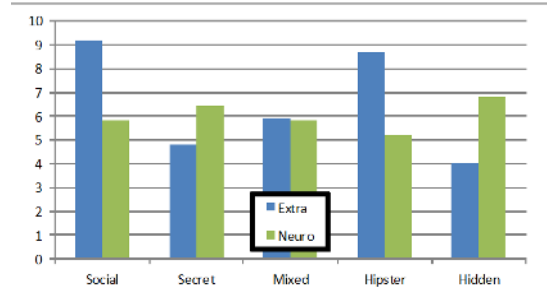
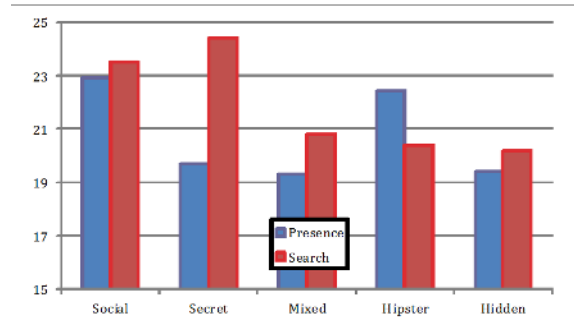


Figure 2: Brony Types by Meaning of Life Variables



Presence of Sustainability Indicators in Five South Carolina Cities

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Abstract — *This paper addresses the lack of studies conducted and conversations held on the sustainability in the state of South Carolina. There is very little research focusing on small, southern cities within the body of work in sustainability within the United States. The purpose of this research is to assess the relative amounts of sustainability in the five largest cities in South Carolina by cataloguing the presence of 38 different sustainability indicators. These indicators allow the reader to form a basic picture of each city and what each is doing to increase sustainability. The author predicted that the cities of Greenville, Charleston, and Columbia would display more indicators because of factors that lend themselves to enhanced sustainability, such as lower age, higher education, and higher income of the population. Through in-person and telephone interviews, and the circulation of a survey based on Kent Portney's 38-indicator index, data was gathered from city administrators in each municipality. Each city was given a score depending on how many indicators were reported present. The cities of Greenville, Charleston, and Columbia reported a slightly higher amount of indicators than Spartanburg or North Charleston. The important takeaway from this study was that many indicators were not included under the municipal tally because they are the function of state and regional organizations, suggesting that South Carolina as a state may have a strong emphasis on sustainability. Many indicators that were excluded from the end totals were present in each city, but had to be excluded because they were not a function of municipal governance.*

Keywords — Sustainability, South Carolina, Renewable Energy, Municipality, Growth

Introduction

This paper will study the Cities of Greenville, Spartanburg, Columbia, Charleston and North Charleston in South Carolina, and their relative levels of sustainability using Kent E. Portney's 2012 criteria for sustainable cities in the United States (www.ourgreencities.com). The concept of sustainability was defined in 1987 by the United Nation's World Commission on Environment and Development, otherwise known as the WCED in its Brundtland Commission report as economic progress and growth for the current generation that does "...not foreclose options for those that follow" (Fiorino, 2010). To this end cities around the

world, including some in the United States, have implemented policies specifically tailored to preserve environmental health and stability while still promoting economic ideals.

It is important to study each of these cities for two reasons; much of the work and research on sustainable cities focuses on the largest cities in the country – this is true of Portney's work. Devashree Saha states in an article for the State & Local Government Review, "...future research should expand the geographic reach from the largest cities to all medium-sized to large cities" (Saha, 2009). An examination of smaller cities, such as those in South Carolina, concerning sustainability will expand the knowledge available to those who study sustainability practices. The second reason that a study of sustainability in these five cities can add to the available knowledge is, just as much of the current knowledge is based on research done in large cities, most of these cities are in the northeast, pacific west, and southwest. An in-depth examination of a greater number of southeastern cities may reveal a different take on sustainability than elsewhere in the country.

Theory Statement

Devashree Saha and Kent Portney illustrate that those cities whose populations are more highly educated, younger, affluent, and unmarried tend to have higher levels of sustainability. A citizenry with these characteristics tends to be more interested in the well being of the community and the environment. As their 'basic needs' are met, this creative-class turns its attention to secondary concerns, namely, what is best for their society and world. Cities whose economic sectors have moved away from manufacturing and towards service sector jobs also tend to have a stronger interest in sustainability – presumably the presence of large manufacturing companies prevents the implementation and success of sustainability practices, as 'green-growth' is still seen as a limiting factor on overall growth and economic success in many areas.

Portney's Sustainability Index is broken down into seven categories, a Sustainable Indicators category (whether the City has defined it's own

specific benchmarks and measures for sustainability), Adoption of smart growth programs, Implementation of land-use planning controls, Transportation planning, Pollution remediation, Energy and Resource conservation, and Administrative and Organizational issues.

In order to learn about the sustainability of each city, city officials in each municipality were interviewed and surveyed to determine if their respective cities have any, some, or none of the indicators that Portney's index lays out. While useful for an overall evaluation and comparison of the cities, the index does not allow for one to draw distinctions between the simple presence of an indicator, and the 'strength' of that presence. One area for improvement in the index used to assess these cities is that it does not allow for a larger score depending on the size and scope of each program or policy.

The results of this survey make for a good overview of the state of sustainability in each city, but can also be described of as a two-dimensional examination. An index that could measure specific amounts of implementation and success of sustainability policies would allow for a more complete, "three-dimensional" understanding of how sustainable each city might be.

My hypotheses, therefore, are as follows:

The cities of Greenville, Columbia, and Charleston are likely to have higher levels of sustainability (higher presence of indicators) than Spartanburg and North Charleston due to their lower age, higher incomes, and educational attainment levels of the populace in each city, as well as the varying (lower) presence of manufacturing in each city.

Data Analysis

City of Spartanburg

After interviewing Chris Story, Assistant City Manager for the City of Spartanburg, and discussing the indicator list with him, a score of 16 was given. This was the lowest score given for any of the five cities. An important facet in Story's discussion of sustainability within the City of Spartanburg was that while the Administration and City Council are concerned with the future of sustainability for the city, the major limitations are its small size (Spartanburg was the smallest city examined in this project) and level of difficulty annexing new properties.

While researching the author found that several of the cities, Spartanburg included, showed presence of sustainability indicators that were not necessarily controlled by the City. For example, the

City of Spartanburg itself does not fund its own asbestos abatement program (Question 19), as asbestos abatement is a function of state law, and funding for abatement comes directly from the state of South Carolina. Alternative energies are also under the control of Duke Power, and Spartanburg Water – a countywide organization, controls the water system.

City of North Charleston

Ryan Johnson, staff for the Office of the Mayor in the City of North Charleston provided information for the City of North Charleston's questionnaire. Its final score was 20, the second lowest score among the five cities. The City of North Charleston places an emphasis on sustainability – it is states on one of the main pages of the city website. While it does not have a designated office of sustainability, Johnson stated that many officials are given tasks and projects in order to specifically improve sustainability.

The City of North Charleston has four different "eco-villages"; Oak Terrace Preserves, Mixson, Hunley Waters, and GARCO – all of which are built with green concepts and sustainability in mind. Another interesting facet about North Charleston is that it's public transit system; CARTA (Charleston Area Regional Transit Authority) is not directly under the city's control – similarly to the Spartanburg Water System. The City of North Charleston does contribute funding to CARTA. Mr. Johnson made the point that "Tax incentives for environmentally friendly development" (Question 7) was fulfilled by state incentives offered by the South Carolina Electric and Gas Company, which provides energy for much of the state that is not covered by Duke Energy. The City of North Charleston also builds all of it's building to meet LEED certification, but due to cost it chooses to forego official designation.

City of Charleston

Carolee Williams, Project Manager for the City of Charleston's Planning, Preservation & Sustainability Department answered the questionnaire, which resulted in a score of 22. The City of Charleston features household waste, industrial, and hazardous waste recycling programs similar to the City of North Charleston, where the county handles hazardous and industrial waste recycling. Besides the City of Columbia, Charleston was the only other city to explicitly assign a department and administrators to focus on Sustainability.

The City of Charleston has also partnered with the South Carolina Sustainability Institute, and through this public-private partnership has

initiated a program to launch the first ‘Eco-District’ in South Carolina. The goal of this eco-district will be to encourage an entirely sustainable mixed-use neighborhood – not just green housing – where businesses, homes, shops, and other activities will all take place under sustainable guidelines. The City of Charleston has also joined several other coastal cities in the region in declaring its support for offshore wind energy development, that is, placing wind turbines off the coast in order to generate more renewable energy.

City of Columbia

Mary Pat Baldeauf, Sustainability Coordinator for the City of Columbia responded to my survey request and discussed the topic of sustainability in the City of Columbia with me. The final score for this city was 22. The City of Columbia has the Climate Protection Action Campaign (CPAC), an office that deals with sustainability and green programs within the Public Works department. This department handles air quality, recycling, energy conservation, green building, transportation, and green business.

The City of Columbia is also similar to the cities of North Charleston and Charleston in that it does not run the public transit, but supports COMET – the transit system in Columbia, which is undergoing a major transition into a 100% alternative energy fleet. The City of Columbia also has two electric vehicle charging stations – and the state of South Carolina is 8th in the nation overall for vehicle charging stations. The City of Columbia is also adding alternative energy fueled vehicles to its fleet. The City of Columbia was also the only city in the study to have its own “Air pollution reduction program” (Question 16) in the form of CPAC, which was formed in 2006 specifically for this purpose.

City of Greenville

Nancy Whitworth, Director of Economic Development for the City of Greenville completed the index survey by circulating it among several administrators within the City of Greenville. This city’s score reached a total of 24, the top score among the cities surveyed. The City of Greenville was the only city to include its own drop off locations for items such as batteries, ink cartridges, cell phones, and eye glasses, as well as the only city to have implemented Integrated Pest Management. It is also unique among the cities in its emphasis on heat mitigation and has increased tree and vegetative cover.

All new construction projects within the city are required to meet Energy Star standards, and the city uses Energy Star appliances for its facilities

and several of its vehicles are fueled with biodiesel, natural gas and propane injection. Most important to the City of Greenville’s sustainability is the existence of the Green Ribbon Advisory Committee, which is citizen led and staffed through the Parks and Development department. This committee includes several prominent businessmen and women within the city, and makes recommendations to the City Council and City Manager. The City of Greenville has also gained several grants in order to fund the Connections for Sustainability program, which holds workshops and seminars within the city in order to raise awareness on urban sustainability.

Conclusions

During research a prominent theme made itself clear for South Carolina. In all of the surveys returned, indicators that had to do with renewable energy resources, air pollution reduction, and industrial/hazardous waste recycling *were present* but were created and run by either non-profit, private businesses, energy companies, or regional and statewide measures. Were these indicators controlled by the municipalities themselves, they would add several points to their overall scores – this may hint at sustainability in South Carolina being a statewide, rather than a municipal issue. The lack of discussion on sustainability in southern cities may not be because the cities lack policies and programs – but rather because sustainability is taking place at a regional and statewide level.

Another addition to be made might be to use (or create) an index that measures levels of implementation where sustainability policies are concerned, rather than their simple presence. This will allow for a more intricate understanding of what cities in South Carolina have done, are doing, and what they can do to make themselves more sustainable.

The original hypothesis was weakly supported by the data gathered. While the cities of Greenville, Charleston, and Columbia did have higher scores (25, 22, and 22 respectively) they were not many points higher than those of Spartanburg and North Charleston (16 and 20 respectively). It is interesting to note that the cities with the highest and lowest scores were the two that are in the same region of the state, and are only a 30-minute drive apart from one another. The overall scores were not excessively low or high on the range from 0-38 and all of the cities placed in the middle range of the possible scores. In order to improve upon the state of sustainability within South Carolina, perhaps a greater emphasis at a regional and state level may be necessary. Although several cities in this study

expressed a dedication to sustainability – and indeed may be more sustainable than this study captured – if many facets of sustainability take place at governmental levels outside of municipal control little can be done to make improvements, from a city-level standpoint.

Acknowledgements

I would like to thank Dr. Abraham Goldberg.

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Sharing Mission Statements through Story Telling

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Abstract — Story telling can be a valuable tool for sharing mission statements of nonprofit organizations. This poster presentation addresses the importance of sharing stories, their key components, technology assisted storytelling, and assist others on how to use story telling effectively. The USC Upstate Nonprofit Leadership Alliance Student Association partnered with a local nonprofit, Senior Centers of Spartanburg (South Carolina), to collect stories of clients and transformed them into a story of the nonprofit's mission statement that would be easy to remember and use by the organization. This project addresses the Core Competencies of Communication, Marketing and Public Relations and Program Development.

Keywords — Story Telling, Mission Statements, Story Cube, Nonprofits

Introduction

“I find most people know what a story is until they sit down to write one.”—Flannery O’Connor

Story telling has been an effective means of communicating important substantive and cultural messages. Great stories create a rich visual imagery in our minds and great storytellers invite us to walk the landscape that is created by this imagery. Learning to tell a story that is captivating and soul-stirring is an art. Beyond social story telling the power of story can move the listener to take action based on its core content. For nonprofits, having a good story to tell others about your organization can move them to offer support. In this poster presentation, the USC Upstate Nonprofit Leadership Alliance Student Association, in partnership with the Senior Centers of Spartanburg, will look at the importance of stories to nonprofits and how to create a story that will motivate supporters.

This project addressed the Nonprofit Leadership Alliance core competencies of Communication, Marketing and Public Relations and Cultural Competency and Diversity.

Nonprofit Leadership Alliance Competency Goals

The USC Upstate Nonprofit Leadership Alliance Student Association will:

- Administer life interview surveys to members of the Senior Center of Spartanburg (Communication, Marketing & Public Relations – Practicing data collection);
- Develop a story narrative from a life interview survey in order to share the Center’s mission statement by using the “Story Cube” application (Communication, Marketing & Public Relations – Select appropriate technology); and
- Practice inter-generational and culturally sensitive communications in collecting life stories (Cultural Competency & Diversity – Use culturally sensitive language in communication).

Types of Stories

There are six basic core stories commonly found in nonprofit organizations: focus, founding, future, impact, people, and strength (Figure 1).¹

Why Nonprofits Need Stories?

It is crucial for nonprofit leaders to be good story-tellers.² Story telling can help organizations advance their missions and supporter base. There are a few questions nonprofit leaders need to ask before deciding what story to tell.

First, nonprofit leaders need to understand the current mindset of the audience. Then, they need to decide what story is going to change that mindset. Then, they need to identify what matters to the audience.

After those questions have been answered, nonprofit leaders need to take the stories that speak to their audience and use those stories to fit different mediums.

The Story Cube

The necessary components or elements in stories may be identified and summarized by using the interactive “Story Cube” creator (character, setting, conflict, resolution, and theme, Figure 2).³ It can be used as a pre-writing tool for developing stories to share mission statements.

Narrative Using Story Cube

“Pat, a 71 year old married female from Spartanburg, recently began experiencing major health issues, including a heart attack that led to visual impairment. Her declining health left her feeling vulnerable and lonely. She was also feeling extremely isolated because her children lived far away. Pat wanted to find a place to exercise, socialize, and improve her overall quality of life.

Pat and her husband heard about the Senior Center by word of mouth recommendations. They visited, began participating, and have expanded their engagement over time into singing, meals, bingo, and Bible study. Thanks to the Senior Center Pat thinks her quality of life has improved greatly!”

This is a great example of how the Center’s mission “fosters independence” to “connect people – programs – purpose – play.”⁴

http://www.readwritethink.org/files/resources/interactives/cube_creator/
⁴ Senior Center of Spartanburg. (n.d.). Retrieved November 18, 2013, from *http://www.scsptbg.org*

Conclusion

Story telling is an easy tool for sharing memorable mission statements of nonprofit organizations. The Story Cube application is a valuable Internet application used to identify the important story components to include.

Members’ stories, like Pat’s, help illustrate the need for the Senior Center of Spartanburg’s mission and may be shared with potential supporters, donors, and future members.

Acknowledgements

We would like to thank Senior Centers of Spartanburg for allowing us to visit their facility and interview some of their members.

We would like to that Pan Angara (professional story teller from Chicago) for providing recommendations and guidance on our research.

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Tables & Figures

strength impact focus
future people founding
people

Figure 1. Different Types of Stories

STORY CUBE

Theme:
Senior Center fosters independence and connects people with programs, purpose and play

Characters:
Pat
Spartanburg, SC

Setting:
Senior Centers

Conflict:
Away from family
Lack of socialization
Declining health

Resolution:
Pat & her husband find and participate at the Senior Center

Favorite:

Story Cube created by:
USC Upstate NLA Student Association

Cut along the outside edges of your Story Map Cube. Then, fold along the dotted lines, making sure that your typed information stays on the outside. Tape the sides together to make a cube.

readwritethink

Figure 2. Story Cube example from Senior Centers of Spartanburg



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Escalated Exposure: First Impressions of Personality and Trust Judgments

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Abstract — *The current study explores the role exposure plays in first impression judgments of trustworthiness. Researchers examined ratings of personality and trustworthiness judgments with limited exposure versus longer exposure. One hundred and forty-eight participants viewed photographs (first) and videotaped interactions (subsequently) of each of three target individuals, rating the trustworthiness and personality of each target after each exposure. We hypothesized that ratings of trustworthiness would increase with increased exposure. We also hypothesized that the accuracy of personality judgments would increase with increased exposure. Results indicated trust ratings were higher after viewing the video interview versus the photograph, and accuracy levels also increased with longer exposure. In addition, more agreeable judges changed their measures of trustworthiness after viewing the video interview of the target to a greater extent than those lower in Agreeableness.*

Keywords — First Impressions Judgments, Exposure, Personality Traits, Trustworthiness

Introduction

First impression judgments are the initial thoughts or assumptions one individual makes about another individual within moments of encountering them. This means during the time that even the simplest interaction is made, whether it be in passing for a brief moment or engaging in some form of communication, both persons will quickly begin making judgments about each other almost systematically and without any formal thought. Previous findings suggest in this initial encounter, impressions can be formed within 39ms and a maximum of 1700ms to gauge the threat level for trusting another individual by whatever information is available to the observer at the time (Bar *et al.*, 2006). The current study explores if, in those brief moments during first encounters, a person has just encountered someone they can trust. The amount and quality of information (Letzring *et al.*, 2006, and Beer & Brooks, 2011) an individual has about a given target individual likely plays a key role in the observer's ratings of trust and the accuracy of personality judgments.

In first encounters with limited amounts of information, an individual may make judgments of

trust based on the limited amount of information made available to them (Engell *et al.*, 2007). Assessments of trustworthiness in first encounters are simply decisions derived from personality traits. Personality traits can be classified according to a Five-Factor Model (Gosling *et al.*, 2003). The FFM consists of Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. Beer and Watson (2008) demonstrated that the most visible and easiest of the traits for a stranger to accurately observe is Extraversion. The quality of time a person has to reveal more personality relevant information about themselves, or their disposition in the first encounter, may make a difference in a person's decisions of trust and confidence. Letzring *et al.*, (2006) examined how quality and quantity of time spent with an individual shaped peoples judgments about each other. They questioned if people who interacted for longer period of times rather than shorter periods of time would have greater accuracy with their judgments. Results revealed participants who interacted for longer periods (quantity) of time had higher levels of accuracy than people who interacted for shorter periods of time. Participants who were placed in situations that had more personality relevant information (quality) available to them scored higher than those with less information. Similarly, Beer and Brooks (2011) noted that accuracy in personality judgments can be increased in a small amount of time, though it has not been determined the best form of communication to achieve the most accuracy.

Trustworthiness is a trait people may be more ambitious to assess quickly in accurate judgments. Specifically, trust correlates with both Extraversion and Agreeableness. Trustworthiness affects each individual in their daily lives, as they encounter strangers or acquaintances each day. Some have taken the view that trust has to be 'earned', which may mean that judgments of trustworthiness should change with the increased exposure we have to a person. Willis and Todorov (2006) examined how people make decisions about personality traits based on facial expressions. Results revealed that a period of 100ms were sufficient for participants to create a first impression, as evidenced by

physiological changes in the brain. As exposure time increased, participant's judgments became more negative and response times were slower, but the confidence in judgments increased. They concluded that with more time, participants gained more confidence in their decisions, but more exposure often changed judgments on trait impressions.

Taking the previous research into consideration, the current study explored the role exposure plays in first impression judgments of trustworthiness. The experiment consisted of participants rating of trustworthiness with limited exposure (photograph of target individual) versus longer exposure (videotaped interaction between the target and an interviewer). We collected trustworthiness between a one second exposure of a target in a portrait and then reassessed after a video interview, which varied between 30-90 seconds across targets. We hypothesized that longer rates of exposure would lead to a) greater accuracy in general personality judgment and b) higher ratings of target individuals' trustworthiness.

Materials

Participants

One hundred forty-eight (107 Female, 41 Male) participants from the University of South Carolina Upstate undergraduate program participated in the study for course credit.

Materials and Procedures

Each participant was given a survey packet at the beginning of each session. The first page of the survey packet included a brief demographic questionnaire and an abbreviated 10 item BFI self-inventory personality assessment to complete (Saucier, 1994). In a classroom setting, participants then viewed three different targets, one photograph and video of each, on a large screen. The participants viewed a portrait of a target for one second, then rated the trustworthiness and general personality (using the TIPI) of the target. After completing the survey for the portrait, each participant viewed a 30-90 second video interview of the target and repeated the trustworthiness and personality ratings. This pattern continued until all three portraits and video interviews had been viewed by the participants in that group (See Figure 1).

Target 106

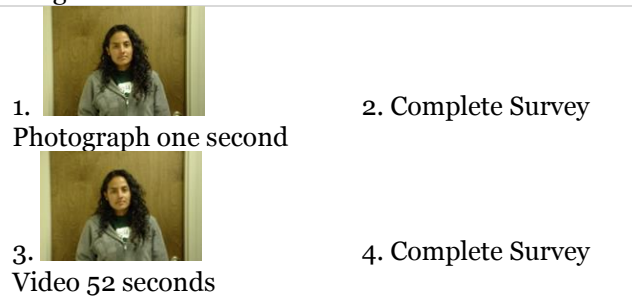


Figure 1. No instructions were given to the targets on how to pose or behave during the portrait or the video interview. The photographs were taken one day while the video interview was completed on a different day. Researchers in the current study selected 50 targets for participants to view at random for a minimum of 5 and a maximum of 10 times during the study. During each trial participants viewed three randomly selected targets' portraits and video interviews. Female-Male-Female and Male-Female-Male selections were alternated throughout the trials.

Results

A 2 (degree of exposure) X 3 (target order) repeated measures ANOVA was conducted to assess differences in trust ratings of first impression judgments based on the length of exposure each participant viewed Targets. There was a significant main effect of degree of exposure photograph versus video interview, $F(1,154) = 116.23, p < 0.0001$. An analysis of the main effects showed trust ratings were higher after viewing the video interview ($M = 5.11, SD = 0.76$) versus the photograph ($M = 4.41, SD = 0.89$). There was no main effect for target order and no interaction between degree of exposure and target order. The main effect is visualized in Figure 2.

A Pearson correlation analysis revealed there was a significant positive correlation between self-rated Agreeableness and changes in trust ratings after viewing the video interview of the target, such that more agreeable individuals were more likely to show increased trust in targets ($r = .16, p < .05$). In terms of accuracy, only one trait could be judged with any degree of accuracy after exposure to the photograph ($r = .16, p < .05$). However, the longer exposure led to significant accuracy correlations for Extraversion ($r = .19, p < .05$), Openness ($r = .31, p < .05$) and Neuroticism ($r = .24, p < .05$).

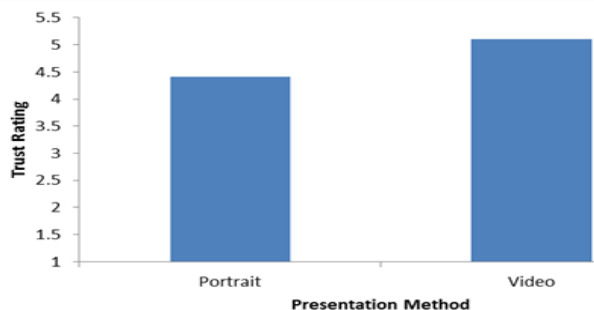


Figure 2. Mean Trustworthiness Ratings across Exposure Type.

Conclusion

The current study explored the role exposure plays in early judgments of trustworthiness. Researchers took into consideration previous research and gathered participants' ratings of trustworthiness with limited exposure versus longer exposure (between the photographs viewed for 1 second and 30-90 second videos). We hypothesized that trust ratings would increase with longer rates of exposure. Indeed, trust ratings increased after viewing the video interview versus the photograph. According to Letzring *et al.*, (2006) results from their study revealed participants who interacted for longer periods (quantity) of time had higher levels of accuracy than people who interacted for shorter periods of time. When participants received more personality relevant information (quality and quantity) they made more accurate judgments of some FFM traits and they generally viewed targets as more trustworthy. We also found that more agreeable participants tended to increase their judgments of target trustworthiness upon exposure to greater information. In future studies, some of our unanswered questions may still need to be addressed. For example, it was not understood what specifically caused changes in levels of trustworthiness. During the target interviews, for example, is it when they talk about their fears? Or is it how often they touched their faces during the interaction?

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A Home Away from Home: The Benefits of Assisted Living Facilities

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Abstract — *Prior to living in an Assisted Living Facility (ALF), the residents see them as a place of abandonment because of the negative connotations formed by others; however, they are far from a place of neglect, but known as a home away from home. This is due to the amount of care provided. ALFs are built on love for the residents so they can enjoy their independence, while still being cared for. The caregivers not only want to give quality care to these residents to help them have a comfortable life, but show them love when their families cannot be there.*

Keywords — Beneficial, Home, Love, Care, Quality

Introduction

As people grow old, they are faced with the dilemma of either living alone or not with the hope that they do not give up on themselves and life. This is where Assisted Living Facilities (ALFs) can be beneficial. Because ALFs are homes within a large building or individual homes within a small community, they can care for the individual resident while still allowing them to enjoy their independence. The top five reasons one might say that ALFs can be beneficial would be safety, transportation, nourishment, worry-free, and socialization (Bursack, 2011). Living in these homes brings about great benefits where the residents can live their lives with others. This may usher in new relationships and friendships characterized of genuineness and love.

Safety

The security is very high in these assisted living homes because the safety of the residents is most important to them. One should know that other than health, the residents' welfare is top priority. This is far from a hospital setting but the staff must check in on them as often as possible following a set schedule and routine. Most of the assisted living homes are equipped with an alarm system. This is to ensure safety from outside harm. However, to be safe is not always to be comfortable. Hence, setting a comfortable place to stay in is likewise ensured. Even though the residents are limited on leaving the premises, they do go out for shopping days or meals outside of the home. As mentioned in an interview from Mrs. V. W., "I feel safe here during

the day and night with the security... and knowing that only the guest I approve of can come to see me, makes me feel safer." So a huge part of providing safety and comfort is taking good care of their basic as well as social needs.

Transportation

Access to movement and transportation are vital in this age because of the inability to drive for many of them. Several ALFs provide a staff member to transport the residents to and from doctor's visits, to get groceries, to run to the post office, or even to take the able ones out to eat. Transporters/Drivers know that it is hard for some of them to get out of their rooms due to immobility, so they are driven to wherever the resident would desire or require to go. ALFs are valued in this because some families have busy schedules and cannot provide this necessity for their family member. Not only do these transporters take them to different locations but they often drive them to church too.

Nourishment

Since these facilities are focused on the happiness and health of their residents, there is usually a well-balanced meal prepared by licensed dietitians. In addition, the residents are taken care of, and reminded to take their medicine to ensure good health. "Performing typical housekeeping, food service, personal care, and medication" is about all a staff member does to help the residents stay healthy (Namazi, 2001, p. 22). Because some of the cognoscente residents want the independence of cooking for themselves, some of the individual homes are equipped to do so. If they are not able, then they can just choose from the prepared menu for what they would like to eat, or even have the independence to go out to dinner sometimes.

Worry-Free Living

Having an aging member of the family who stubbornly insists on being independent poses a valid and serious concern for many families. Concern for their safety, health, and lack of mobility create legitimate reasons for worry. With assisted living homes, one can trust their loved one

is cared for in times of self-inflicted harm, falling, or even forgetting/slipping. In addition, most elderly become weak and their bones become very fragile so when they cannot do for themselves, the burden and the worry are lifted from the family because the assisted living homes are there.

Socialization

With great benefits come great friendships in assisted living homes. Another great aspect to single-family resident homes is the feel and sense of community. From weekly mixers, to bingo, and even shopping with the “girls”. A resident from Dillon Pointe Assisted Living Facility, Ms. M.V. says, “We have weekly karaoke too! It is just noise to me, though...”. With ALFs you can feel secure in making your loved one live there if you cannot be with them. ALFs provide the opportunity to have fun and be worry free. Not only does this keep the residents active but it keeps their minds off the struggles they face, and gives them the opportunity to build new relationships and friendships. Another huge advantage is the option of a resident to live with his/her spouse in the same suite. Regardless of being moved to an ALF, nothing can take the place of having your spouse there with you.

Conclusion

In conclusion, there comes a time when a decision to send a loved one to an ALF becomes critical. Not only do they establish a sense of home but they likewise offer safety, transportation, nourishment, worry-free living, and socialization. These factors are especially important if the resident is not fully cognoscente or has little capability to do things on his own. An important highlight is the option of staying in a room/suite to themselves or with their spouse. ALFs are far from the typical hospital or nursing home room because it includes more of the home-life feel. Residents can feel worthy and appreciated by living in these facilities because they still have the opportunity for independence but the knowledge that someone is there to help them when they need it.

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Divorce, Parental Conflict and Adult Children's Relationship Attitudes: Examining the Connection

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Abstract — Undergraduates between the ages of 18 and 25 at a public southeastern university were surveyed to explore the impact of parents' divorce and level of parental conflict on the students' attitude towards romantic relationships. Parents' divorce was related to more positive attitudes toward divorce, but unrelated to relationship wariness. Interparental conflict was not related to either divorce attitudes or relationship wariness. There was a significant correlation between the attitudes toward divorce and relationship wariness, with positive attitudes being related to greater wariness. However, students who were currently in a romantic relationship were more likely to have parents who were still together and had significantly lower levels of relationship wariness than those who were not in a romantic relationship. Implications of the findings are discussed.

Keywords — parental divorce, divorce attitudes, parental conflict, relationship wariness, romantic relationships

Introduction

Numerous studies have examined the impact of parental divorce on a host of developmental and relationship variables on children. Early research on the effects of divorce on children primarily focused on pre-school, school-age, and adolescent children, with limited focus on young adult children (e.g., Hetherington, Cox, & Cox, 1979; Wallerstein & Kelly, 1980). Additionally, children of divorced parents were compared with children from married parents, with no attempt to measure level of parental conflict.

Subsequent research has included parental conflict in its assessment, and has found that children from divorced families actually do better on a number of social and emotional measures than children from high-conflict intact families (e.g., Amato & Booth, 1997; Jekielek, 1998; Strohschein, 2005). More recently, researchers have examined the impact of parental divorce on the intimate relationships and attitudes toward such relationships of young adult children, finding lower levels of relationship commitment, higher levels of relationship anxiety, and higher rates of relationship dissolution among children of divorce

(Bartell, 2006; Burns & Dunlop, 1998; Cui, et al., 2011).

The current study attempts to build on previous research by examining the effect of both parental divorce and parental conflict on young adults' wariness about romantic relationships and their attitudes toward divorce. In addition, how do these variables predict their likelihood of being in a current romantic relationship?

This research is important for several reasons. First, forming and sustaining intimate relationships are critical developmental tasks as part of the transition to adulthood. Further, establishing and ending romantic relationships has implications for a young adult's well-being. And early patterns regarding intimate relationships, both in terms of attitudes and behaviors, may predict future relationship behaviors later in adulthood. Thus, determining one's attitudes about entering intimate relationships, as well as ending them, is likely to be valuable in furthering our knowledge in this area, and the nature of one's parents' marriage and divorce seem to be particularly relevant explanatory factors.

Review of Literature

Various studies have examined the influence of divorce and levels of parental conflict on young adult children's attitudes and behaviors regarding romantic relationships. In a longitudinal study of Australian youth, Burns and Dunlop (1998) interviewed adolescents who were 13-16 at the time of their parents' divorce and assessed them again 3 years and 10 years later on a number of variables related to their relationships with their parents and their own attitudes toward intimate relationships. Interestingly, no differences were found between children from divorced versus intact families on attitudes toward divorce or on relationship wariness ten years later. The authors suggest that one reason for this may be respondents' age at the time of their parents' divorce – 13-16 – may have been past the age of greatest vulnerability. However, level of interparental conflict was not assessed in this study.

Whitton and her colleagues (2008) investigated the effects of divorce and marital commitment among a sample of 625 engaged couples before their first marriage. Although not restricted to young adults – their participants ranged from 17-46 years of age with a mean of 26 years – their research still has relevance for the current study. Interestingly, parental divorce was related to lower levels of commitment and confidence in respondents' current relationships, but only for women. These relationships still held after controlling for parental conflict.

In a study of 821 adults, Segrin and colleagues (2005) found that both parental divorce and conflict were related to negative attitudes toward marriage. Those who had experienced parental divorce not only were more accepting of divorce, but were more likely to have been divorced, marry someone who had been divorced, and marry someone whose parents had divorced. However, after controlling for interparental conflict, the relationship between parental divorce and negative attitudes toward marriage was no longer significant. High levels of interparental conflict were associated with a decreased likelihood of being in a relationship as an adult.

Riggio (2004) studied the effects of divorce and parental conflict on several outcome measures, including relationship anxiety, among 566 students from six colleges and universities ranging in age from 18-32. Students were overwhelmingly undergraduate (90%) and over 60% female. Interestingly, students from high conflict families had higher levels of relationship anxiety – defined as “the tendency to experience anxiety and discomfort in close relationships (p. 103) - than those from low-conflict families. However, students whose parents had divorced experienced less relationship anxiety than students from intact families. These effects held after controlling for sex, parent's remarriage status, and socioeconomic status.

In 2008, Riggio and Weiser looked at the role of parental divorce and parental conflict in young adult children's attitudes toward marriage among 400 college undergraduates. Individuals whose parents divorced had more negative attitudes toward marriage, as well as lower expectations for relationship success. Students who reported high levels of interparental conflict reported higher levels of conflict within their own romantic relationships.

A series of studies by Cui, Fincham and colleagues have focused on the impact of parental divorce and parental conflict on college students' romantic relationships. Cui, Fincham, and Pasley (2008) examine the roles of parental divorce and

parental conflict on the level of conflict in college students' romantic relationships. They found that that parental conflict was associated with students' conflicts with their own relationship partners, and that this conflict behavior, in turn, was associated with diminished romantic relationship quality. And while initially parental divorce was linked to difficulties in students' current relationship, after parental conflict was considered, the effect of parental divorce disappeared.

Cui, Fincham and Durtshchi (2011) surveyed 571 undergraduates at a southern university, examining the relationship between parental divorce, interparental conflict and the dissolution of students' romantic relationships. They predicted an indirect relationship between parental divorce and relationship dissolution that was mediated by their attitudes toward divorce and by their commitment to their relationships. As expected, parental divorce was associated with more favorable attitudes toward divorce, which led to lower levels of commitment to their own romantic relationships, and thus, higher rates of relationship dissolution over the 14 weeks of the study.

Moreover, the researchers also predicted that higher levels perceived level of parental conflict would also be associated with relationship dissolution. And again, as predicted, interparental conflict was positively related to parental divorce and positive attitudes toward divorce. Interestingly, among students from divorced families, the lower the interparental conflict, the more parents' divorce was perceived as unnecessary, the less favorable their attitudes toward divorce, and the less likely to dissolve their current relationship.

Cui and colleagues conclude that it may be parental conflict *before* the divorce that could lead to relationship wariness, more favorable attitudes toward divorce, and therefore, a greater willingness among young adult offspring to end their own romantic relationship.

And in an earlier study of 258 undergraduates at a southern university, Cui and Fincham (2010) also found similar patterns of independent effects of parental divorce and parental conflict on negative attitudes toward marriage and low relationship quality. Students from divorced families had more negative views of marriage and lower levels of relationship commitment, and thus romantic relationships of less quality than students from intact families. Higher levels of interparental conflict were related to higher levels of conflict with children's relationships, resulting in lower quality romantic relationships.

Methods

Sample and Data Collection

Questionnaires were administered to 130 USC Upstate students in introductory sociology classes in the Fall of 2013. The questionnaire assessed demographic information, as well as attitudes toward divorce, relationship wariness, level of parental conflict, and whether the respondent was currently in a romantic relationship. The sample was 53% white and 36% black, with nearly 65% being female. Respondents who had a parent who died while still married, or whose parents never were together were excluded from the analysis. Of the remaining 123 respondents, sixty-two percent reported that their parents were still together, while 46% said their parents were divorced or separated. Slightly over half – 54% - were currently in a romantic relationship.

Measures

Parents' Marital Status.

This variable was assessed using the following item: Are your parents living together or are they divorced or permanently separated? Respondents whose parents never lived together, were raised by a single parent, or whose parent was widowed were excluded from the analysis.

Interparental Conflict.

Respondents' perception of conflict between their parents was assessed using a modified, shorter version of the Children's Perceptions of Interparental Conflict Scale (Grych, Seid, & Fincham, 1992), developed by Cui, Fincham, & Durtschi (2011). Twelve items were selected from the original instrument that assessed three distinct dimensions of conflict behavior: frequency, intensity, and resolution. Possible responses for each item were: 1 = true, 2 = sort of true, and 3 = false.

Relationship Wariness.

A 12-item scale developed by Burns & Dunlop (1998) was used to measure wariness about long-term relationships, marriage, and family, based on the research of Wallerstein and Blakeslee (1989). Possible responses ranged from "very like me" (4) to "very unlike me." (1). Responses were summed so that the total possible scores ranged from 12-48, with a higher score indicating a greater level of relationship wariness.

Attitudes toward Divorce.

Attitude toward marriage and divorce was measured using the six-item Attitude toward Divorce Scale developed by Amato, Booth,

Johnson, & Rogers (2007). Possible responses ranged from strongly disagree (1) to strongly agree (4). A higher score indicates a more favorable attitude toward divorce.

Findings

Parental divorce was related to attitudes toward divorce ($t = -1.96, p = .05$), with respondents from divorced families having more positive attitudes toward divorce ($\bar{x} = 15.2$) than those whose parents were still together ($\bar{x} = 14.1$). Parental marital status was unrelated to relationship wariness, with means for those from divorced vs. intact families being 21.1 and 20.8, respectively ($t = -.254, p = .80$). Interparental conflict was not related to divorce attitudes ($r = .061, p = .54$), nor relationship wariness ($r = -.014, p = .89$). Not surprisingly, both dependent variables are significantly correlated with each other - the more positive one's attitudes toward divorce, the greater the relationship wariness, ($r = .234, p = .01$).

Further analysis revealed that parental divorce and relationship wariness were significant predictors of current romantic relationship status. Respondents who were currently in a romantic relationship were significantly more likely to have parents who were still together. In addition, those who were in romantic relationships had significantly higher levels of relationship wariness compared to those who were not, with means of 22.9 vs. 20.4 respectively ($p = .01$). No significant differences were found on the basis of current relationship status regarding attitudes toward divorce or parental conflict.

Conclusions

Consistent with previous research, parents' marital status did predict attitudes toward divorce. And consistent with Burns and Dunlop (1998), no relationship emerged between marital status and relationship wariness. Somewhat surprisingly, parental conflict predicted neither support for divorce nor wariness about intimate relationships.

However, upon further reflection, an examination of previous studies suggests that parental conflict appears to predict attitudes and behaviors regarding individuals' *current* relationships, yet be less relevant for explaining their *attitudes* about relationships in general. So perhaps parental conflict may not affect individuals' ideas about relationships generally, but only when they have that as a lens through which to interpret behaviors and attitudes in their actual relationships.

Finally, those respondents who were currently in romantic relationships had significantly lower levels of relationship wariness than those who were not. But there were no differences between those two groups on attitudes toward divorce or parental conflict. So, if relationship wariness is related to positive divorce attitudes and lower likelihood of being in a romantic relationship, but is not predicted by parents' divorce or conflict, future researchers need to identify the factors that lead young adults to be wary about intimate relationships.

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Language in the Classroom: An Observation

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Abstract — *This article looks at the classroom as a microcosm of society and seeks to observe sociolinguistic patterns and usages occurring in a class. The hypothesis of the paper before observing is that students would speak informally with one another in non-standard ways but code-switch to a more formal register in the classroom. I also hypothesized that teachers would expect more formal speech in the classroom, and that those who speak with marked speech dialects would have a harder time in the classroom. This is a work in progress. I will be observing the class until the end of March. So far I have discovered some interesting findings including gender differences and the heterosexual marketplace being played out in the classroom, an alarmingly low number of minority groups in the class, and evidence which makes me suspect self-fulfilling prophecies are working against minority students.*

Keywords — Self-fulfilling prophecy, heterosexual marketplace, style-switching

Introduction

The classroom is an environment in which students and teachers spend much of their time. Students speak in a certain way in the classroom and so do teachers. How do teachers speak to students and how do students speak to teachers? Who decides which language will be used in the classroom and what are the consequences for those students who do not comply or conform?

As an aspiring teacher, I will use this paper to explore the classroom as a social environment and will observe what happens sociolinguistically. I will be looking for examples of code-switching and will look to see if students follow stereotyped interactional models. I will be looking to observe speech patterns and types that are prevalent.

Before I entered the classroom I hypothesized that students would speak informally with one another in non-standard ways but -switch to a more formal register in the classroom. I also hypothesized that teachers would expect more formal speech in the classroom, and that those who speak with marked speech dialects would have a harder time in the classroom. This study is a work in progress. I am in the process of examining the speech patterns by gender, ethnicity and age in an elective creative writing class at Boiling Springs high school. . At the time of this writing I have

observed several class sessions and will continue to observe and refine my findings through the end of March in anticipation for the presentation of my results in April.

Other's Research

In preparation for my classroom observations I explored the topics hypothesized above. In terms of missing codes, according to Sociolinguistic researcher, Nikolas Coupland, code-switching can be observed when people mix forms from two or more dialects in a single conversation (Coupland, 1980). Two types of code-switching occur in the classroom, situational and metaphorical. Situational code-switching is “when code-switching is constrained by the social context”; metaphorical code-switching is “when code-switching is used as a sociolinguistic resource, rather than just to respond to context” (Van Herk, 131). Educationally speaking researchers have traditionally examined two codes. The “elaborated code” is comprised of standard syntax and complex sentence structure and is traditionally associated with the middle and upper classes. The “restricted code” generally reflects short, simple phrases that are often left unfinished. Utterances following this code demonstrate less adherence to standard conventions and are often associated with individuals from lower socioeconomic class backgrounds (Bernstien, 1964).

With regard to expectations, Van Herk discusses the concept of self-fulfilling prophecies. A self-fulfilling prophecy is one that “causes itself to become true. The term is often used in education to suggest that high teacher expectations for a particular student lead to success for that student” (2005, p. 179). Schools often fail non-standard speakers by assuming they are unable to perform complex work or think abstractly because of the patterns of the code they employ. While ethnicity is not a direct correlate with elaborated or restricted codes, racial or ethnic stereotyping may contribute to expectations many teachers and even some students may use as a basis for their prophecies. It should be noted here that self-fulfilling prophecies may work in both directions. Students who employ standard language structures and portray confidence with academic endeavors may garner

positive prophecies while others with equal intelligence but different backgrounds may be told they are unlikely to succeed (Cross, et al, 2003). One source indicated "several studies of students from the Caribbean detail the difficulties they encounter at school for reasons of linguistic and cultural contrasts" (Reaser and Adger, 164). Riley et al. stated that "the term teachers' expectations describe the inferences teachers make regarding students' potential to achieve in the classroom. These inferences may be influenced by a number of factors....such as a student's aptitude for academic achievement, external factors such as IQ test scores, as student's family background, and comments made by former teachers regarding a student's performance" (Riley et al., 304-305). They pointed out that these inferences "may shape teachers' perceptions of students before they enter the classroom" (Riley et al., 304-305). Self-fulfilling prophecy also affects the self-perception of students. I hypothesize that the absence in this class of more African-Americans, Hispanics and other groups who have been labeled with marked non-standard speech patterns is the result of negatively oriented self-fulfilling prophecies.

Van Herk points out that in middle school students "develop sharply defined ways of being" because of "age-specific focus" and "the typical intensity of adolescent expression and the number of hours that students spend together" so that a "heterosexual marketplace" is established (2005, p. 176). Van Herk also states that "students presumably use language features to show where they fit in with respect to the communities of practice active in their schools" (2005, 176). Eckert, a sociolinguist renowned for her work on language and gender, observed that "gendered performances are available to everyone but with them come constraints on who can perform which personae with impunity. And this is where gender and sex come together as society tries to match up ways of behaving with biologically based sex assignments (Eckert and McConnell-Ginet, 2013). Students have been a part of the school system for most of their lives, and Eckert observed that "up until [middle school age], boys and girls may have seen themselves as simply different, and perhaps as incompatible, in the context of the heterosexual market, boys and girls emerge as complimentary and cooperating factions" (Eckert and McConnell-Ginet, 2013; p. 31). Eckert further states, "educational institutions also reproduce the gender order in myriad ways. As prime sites for socialization, schools are key institutions for the construction of gender" (Eckert and McConnell-Ginet, 2013; p. 31). Since I am observing a high school classroom, gender can be expected to play a

significant role in discussion and other interactions.

Research & Observation

The creative writing class at Boiling Springs high school contains fourteen students. Immediately upon entering the classroom I noticed an overwhelming majority of Caucasian students, only two African-American students, and no observable other ethnic students. Twelve students are white; two students are black. The gender mix is relatively even. Six students are male; eight students are female. Five of the males are white; one is black. Seven of the girls are white; one is black. I noticed none of the students are Hispanic or of any other traditionally marked ethnicity. The teacher of the class is a white male approximately fifty years old.

I am observing the use of elaborated and restricted codes in the classroom. I am also paying close attention to gender differences and ethnic differences in students' speech. self-fulfilling prophecies (if possible); Finally, I am attempting to observe teacher-student and student-student interactions before and after class to see if any parties switch codes during the less formal times between class sessions.

During my first three observations, I have noticed that the predominant speech style is Standard American English. This surprised me because I expected the Southern dialect to be more prevalent. The students' use of Standard American English shows that they are more inclined to use elaborated code rather than restricted code. While my limited time in the classroom has not yet afforded me the opportunity to converse with students about their backgrounds, it seems highly likely that the lack of those who speak with more restricted code could be a result of self-fulfilling prophecy. In other words because "creative writing" class has more of a Standard American English connotation, students who use non-standard or restricted code will be less likely to choose this elective class. Also, in the three visits I have been able to make so far, I have not observed any code-switching before or after class. It is possible that students switch into the restricted code in the halls, but at least to this point, I have observed only elaborated code use in the classroom, before, during, and after class.

I have observed some degree of informality in the classroom. For example, I have noticed that none of the students say "sir" to the teacher, although they do refer to him by "Mr." plus his family name. They also used words like "yep" to him. This suggests that the students use informal

forms of address, at least with this particular teacher. Beyond this, however the speech the students use seems very Standard and quite formal although the atmosphere the teacher creates is fairly relaxed.

In terms of gender I have noticed the male students tend to be more assertive toward each other and the girls in the class than the female students are. One of the girls made a comment about the poem being kind of a metaphor and a boy responded emphatically and rudely, "it IS a big metaphor." Another of the girls speaks softly and shyly and looks down a lot as she makes comments in the class. In one of my observation times the students presented a piece of their writing in front of the class. I looked for usages of restricted and elaborated code, and gender differences in their presentations. Across the board, all of the females in the class tended to use upward speech in the classroom—ending sentences with rising intonation in the manner traditionally used for questions, but now associated with middle class feminine language. Further, females showed more enthusiasm and emotion in their writing and reading. One girl even cried while reading her story. Males in my class observation tended to have more assertive speech and often interrupted others. This behavior applied not only to the students but to the teacher as well. Male students' writing also tended to be darker and less emotional as they shared mostly nightmare and horror stories. The females in the class outnumber males, yet the males dominate the conversations and often interrupt both the females in the class and each other.

The class speaks in what might be loosely termed casual Standard American English (essentially the elaborated code without rigid structure). Sometimes I picked up on vestiges of the restricted code like *g-droppin'*, Southern pronunciation of vowels like *pipe* sounding like *pahp*, and African American English pronunciation of some words *career* sounding like *cah-ruhr*. Surprising to me is the fact that the teacher employs the most non-standard features. He often uses the informal *ya'll* and he drops many more word final "g"s than the students do.

Summary & Conclusion

Based on my observations, the students in this elective class all exhibit a high degree of proficiency in the elaborated code that is Standard American English. I also found that, on the surface, it appears that the teacher may be attempting to lower the formality level of the classroom by using a more casual style with his g-dropping and frequent use of

dialectal forms such as "ya'll". My preliminary observation is that the students may not be totally comfortable with this, but this is an area for further research. The elaborated code of the students is far more prevalent than the restricted code in this classroom, although a limited amount of restricted code does come out at times when the students are relaxed. Finally I noticed a strong difference between the genders in the class, with males being more assertive and dominating the speaking and using more stereotypically masculine content to write about and the females being more supportive, emotional and choosing more stereotypically feminine content to write about. The heterosexual marketplace is in full force by the time students take this course (mostly 11th and 12th graders) and my observations support the research which suggests gender differences in language production will be strong at this age. Since the classroom as a sociolinguistic environment may be considered a microcosm for society as a whole, I hope, as a future teacher, to have some impact on changing the perpetuation of these negative roles, like self-fulfilling prophecies and gender inequality by creating an equal environment and by bringing about awareness in my fellow teachers with regard to inequalities and stereotypes that should not persist in a democratic nation. I hope that in working within my small sphere of influence I can help bring change to our society as a whole.

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Sorry, I must Dash: On the Use of Punctuation in Harry Potter and the Sorcerer's Stone

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Abstract – This paper examines the use of the dash in comparison to other punctuation marks using three sample passages from J. K. Rowling's novel, *Harry Potter and the Sorcerer's Stone*. The study was conducted using content analysis on three emotive, or highly emotional, passages of roughly equal length from the beginning, middle, and ending sections of the novel. The results indicated that Rowling regularly employs the dash in place of four more traditional punctuation marks to add emotive effect.

Keywords – dash, run-on, emotive, Harry Potter

Introduction

“Grammar may well be arbitrary and irrelevant, but it is also clearly a point of fascination and obsession in this novel” says Taylor-Batty of Beckett's *L'Innommable* (2007, p. 164). This quote pertains equally to many pieces of literature, including J. K. Rowling's *Harry Potter and the Sorcerer's Stone*. In her novel, Rowling uses a punctuation mark known as the dash frequently and for a variety of purposes. In addition to its own syntactical functions, the dash is often used in place of other punctuation marks. The purpose of this study is to compare and contrast how the dash is used, using emotive sample passages from J. K. Rowling's novel. Rowling often uses the dash in emotive contexts, that is, in instances of heightened emotion, such as excitement, anger, agitation, and fear. Grammatically, this can lead to run-on sentences. The more dashes in a sentence, the more likely it is to be a run-on sentence.

Traditionally, the dash has two official functions: 1) Interruptions within a sentence and 2) Appositives. In its first function, the dash is generally used to call attention to, or set off, any interrupting structures (Kolln, 2007). In other words, the dash can be used to indicate an abrupt break in thought (Warriner & Griffith, 1973). For the second function, the appositive signalers, namely, that is, and in other words, can be preceded by either a comma or a dash. Also, using this type of construction, the dash and the colon are

frequently interchangeable. The dash gives the appositive more emphasis.

In *Harry Potter and the Sorcerer's Stone*, Rowling makes frequent use the dash in place of other, more traditional, alternatives during times when the characters are in emotive states—that is, she uses the dash as a substitute for other punctuation marks to achieve a more emphatic effect when the characters are in a state of heightened emotion. This substitution usage can prove to have a myriad of effects. For instance, while this increased usage of the dash can arrest the attention or indicate an interruption in thought, the oversaturation results in a large number of run-on sentences. Run-on sentences are independent clauses that have been joined without proper punctuation and conjunction (Hacker, 2000). This happens rarely in sentences where Rowling uses traditional punctuation and never in the excerpts examined for this study.

For the purpose of this study, three sample passages, numbering between 300-350 words each, were chosen from the chapters at the beginning, the middle, and the ending of *Harry Potter and the Sorcerer's Stone*. Each passage was chosen for its emotive content. The total number of dashes in each example was tallied, and then each dash was classified according to which traditional punctuation mark it appears to be replacing. The dash was used as an interchangeable substitute in various contexts for four different types of punctuation: the comma, the period, the colon, and the ellipsis. The tallying process was then repeated with these four traditional punctuation marks. Finally, each sentence was examined in terms of independent clause and the grammaticality of the joining of multiple clause sentences. Each sentence was categorized as being either a traditional complete sentence or a run-on sentence. The results of the analysis are shown in Table 1 below. Each sample passage can be found in the Appendix.

Findings

Table 1: Punctuation Type & Substitution

	,	.	:	...
Dash Substitutions	13	12	3	7
Traditional Usage	79	58	1	4

Each sample passage proved to have more than ten dashes, used in at least three different ways. The most frequent dash substitution was for the comma, followed closely by the period. Line 7 of Sample 3 shows this comma substitution clearly, “But, Harry – what if You-Know-Who’s with him?” (Rowling, 1997, p. 287). Rowling uses the dash here instead of the comma after a direct address to show the speaker’s hesitation. But a comma would be the traditional usage. Lines 25-27 of Sample 3 show a similar substitution for the period:

He put the bottle down and walked forward; he braced himself, saw the black flames licking his body, but couldn’t feel them – for a moment he could see nothing but dark fire – then he was on the other side, in the last chamber. (Rowling, 1997, p. 287).

Both dashes in this example could be replaced with periods—which would also have prevented this sentence from becoming a run-on. Nevertheless, it shows how the dash can be used to replace the traditional use of the period.

Seven situations which would traditionally take ellipses were found in the excerpts. One such instance occurs in Line 2 of Sample 1: “You don’t mean – you *can’t* mean the people who live *here*?” (Rowling, 1997, p. 13).

But another notable cross-usage of Rowling’s was her usage of the dash as an ellipsis, to signify hesitation. One such example was found in Line 20 of Sample 1: “You think it – *wise* – to trust Hagrid with something as important as this?” (Rowling, 1997, p. 14). In this example, both dashes would traditionally be ellipses, instead, to show hesitation before and after the dash-enclosed word.

In all of the three excerpts only three dashes appeared in structures that would traditionally use a colon, making this the least substituted mark. This is apparent in Lines 9-10 of Sample 2:

The sun shone brightly on a stack of cauldrons outside the nearest shop. Cauldrons – All Sizes – Copper, Brass, Pewter, Silver – Self-Stirring – Collapsible, said a sign hanging over them. (Rowling, 1997, p. 71).

In this example, a color traditionally belongs after “Cauldrons – All Sizes” to show the start of a list of properties pertaining to the cauldrons of all

sizes. It is replaced with a dash, instead. The scarcity of this type of substitution is reflected in the fact that only one actual colon appears in all of the three passages. Incongruously, none of the dashes found in the three excerpts follow the traditionally accepted use of the dash. Table 1 shows how many times the dash was used in place of other punctuation marks.

There was some concern that using the dash would lead to an increase in the number of run-on sentences. The next part of the study involved tallying up the number of run-on sentences and the number of complete sentences that occurred when a sentence contained a dash versus when a sentence used traditional punctuation only. Also, there were a few fragment sentences, but they were not marked or otherwise noted because they had no relevance to the study.

Table 2: Sentence Types

	Run-on	Complete
With Dash(es)	10	11
Traditional Only	1	48

There were a nearly equal number of traditional sentences and run-on sentences as a result of using the dash to show a character’s highly emotional state, as shown in Line 59 of Sample 2, “He does tend to – what was that?” (Rowling, 1997, p. 14). According to the results shown in Table 2, when the sentence contained at least one dash, the number of run-on sentences compared to the number of complete sentences was nearly equal. This suggests there is a positive correlation between using the dash as a substitute punctuation mark and run-on sentences. Comparatively, when the sentences contained only traditional punctuation, only one run-on sentence appeared in the three passages examined here. Therefore, the use of the dash correlates with a drastic increase of run-on sentences. One of the most notable examples of this can be found in Sample 2, Lines 3-5:

The brick he had touched quivered – it wriggled – in the middle, a small hole appeared – it grew wider and wider – a second later they were facing an archway large enough even for Hagrid, an archway onto a cobbled street that twisted and turned out of sight. (Rowling, 1997, p. 71).

There are no fewer than four dashes in this run-on sentence, and each dash could be replaced with a period, signifying a complete sentence. Technically, this single run-on sentence is a complete sentence four times over. The dashes lead to a very convoluted statement, perhaps as Rowling’s attempt to make the reader feel the stress

of the character's situation. The run-on with the most amount of substitutions was in Lines 13-14 of Sample 3: "Me!" said Hermione. "Books! And cleverness! There are more important things — friendship and bravery and — oh Harry — be *careful!*" (Rowling, 1997, p. 287). In this example, there were three dashes, and each dash could be substituted for a different punctuation marks: the colon, the ellipsis, and the comma, respectively. As the sentence is a run-on, this again shows how using the dash can lead to run-on sentences.

Conclusion

In conclusion, Rowling uses the dash in place of a variety of more traditional punctuation marks when she wishes to portray characters in a heightened state of emotion. This, however, leads to run-on sentences nearly as often as it does to traditional complete sentences. This study has shown that the dash can be used interchangeably with at least four other types of punctuation marks, but that there are potential drawbacks to be aware and wary of. Yet within these sample passages, the dash supersedes its normal lexical and syntactical boundaries, in what appears to be an evolution of this adaptable punctuation mark. The dash, in other words, is one of the most versatile marks of punctuation, as shown multiple times in Rowling's

novel, *Harry Potter and the Sorcerer's Stone*. Further studies might explore the effect, in terms of individual emotional outcome, that each dash substitution has on readers of Rowling's text and whether this emotion is actually heightened by the use of the dash, in place of the more traditional punctuation marks.

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Appendix

Sample 1 (~333 words) – Excerpt from Chapter 1 – *The Boy Who Lived*:

Dashes are followed by the "traditional punctuation" determined to have been substituted in each situation. Sentence types are bolded and in parentheses. The black fonts indicates sentences with at least one dash, and the traditional sentences are in red. **(C)** indicates a complete sentence; **(R)** indicates a run-on sentence.

- 1 "I've come to bring Harry to his aunt and uncle.(C) They're the only family he has left now."(C)
 2 "You don't mean —(...) you can't mean the people who live here?"(C) cried Professor McGonagall,
 3 jumping to her feet and pointing at number four. "Dumbledore —(.) you can't.(C) I've been watching
 4 them all day.(C) You couldn't find two people who are less like us.(C) And they've got this son —(...) I saw
 5 him kicking his mother all the way up the street, screaming for sweets.(R) Harry Potter come and live
 6 here!"(C)
 7 "It's the best place for him,"(C) said Dumbledore firmly. "His aunt and uncle will be able to explain
 8 everything to him when he's older.(C) I've written them a letter."(C)
 9 "A letter?" repeated Professor McGonagall faintly, sitting back down on the wall. "Really, Dumbledore,
 10 you think you can explain all this in a letter?(C) These people will never understand him!(C) He'll be
 11 famous —(.) a legend —(.) I wouldn't be surprised if today was known as Harry Potter day in the future —
 12 (.) there will be books written about Harry —(.) every child in our world will know his name!"(R)
 13 "Exactly," said Dumbledore, looking very seriously over the top of his half-moon glasses. "It would be
 14 enough to turn any boy's head.(C) Famous before he can walk and talk!(C) Famous for something he
 15 won't even remember!(C) Can't you see how much better off he'll be, growing up away from all that until
 16 he's ready to take it?"(C)
 17 Professor McGonagall opened her mouth, changed her mind, swallowed, and then said, "Yes —(.) yes,
 18 you're right, of course.(C) But how is the boy getting here, Dumbledore?"(C) She eyes his cloak suddenly
 19 as though she thought he might be hiding Harry underneath it.(C)
 20 "Hagrid's bringing him."(C)
 21 "You think it —(...) wise —(...) to trust Hagrid with something as important as this?"(C)
 22 "I would trust Hagrid with my life," said Dumbledore.(C)

23 “I’m not saying his heart isn’t in the right place,” said Professor McGonagall grudgingly, “but you can’t
24 pretend he’s not careless.(C) He does tend to —(...) what was that?”(R)
(Rowling, 1997, 13-14)

Sample 2 (~301) – Excerpt from Chapter 5 – Diagon Alley:

1 “Three up... two across...” he muttered. “Right, stand stack, Harry.”(C)
2 He tapped the wall three times with the point of his umbrella.(C)
3 The brick he had touched quivered —(.) it wriggled —(.) in the middle, a small hole appeared —(.) it grew
4 wider and wider —(.) a second later they were facing an archway large enough even for Hagrid, an
5 archway onto a cobbled street that twisted and turned out of sight.(R)
6 “Welcome,” said Hagrid, “to Diagon Alley.”(C)
7 He grinned at Harry’s amazement.(C) They stepped through the archway.(C) Harry looked quickly over
8 his shoulder and saw the archway shrink instantly back into the solid wall.(C)
9 The sun shone brightly on a stack of cauldrons outside the nearest shop. Cauldrons —(.) All Sizes —(:)
10 Copper, Brass, Pewter, Silver —(.) Self-Stirring —(.) Collapsible, said a sign hanging over them.(C)
11 “Yeah, you’ll be needin’ one,” said Hagrid, “but we gotta get yer money first.”(C)
12 Harry wished he had about eight more eyes.(C) He turned his head in every direction as they walked up
13 the street, trying to look at everything at once: the shops, the things outside them, the people doing their
14 shopping.(C) A plump woman outside an Apothecary was shaking her head as they passed, saying,
15 “Dragon liver, seventeen Sickles an ounce, they’re mad....”(R)
16 A low, soft hooting came from a dark shop with a sign saying Eeylops Owl Emporium —(:) Tawny,
17 Screech, Barn, Brown, and Snowy.(C) Several boys of about Harry’s age had their noses pressed against a
18 window with broomsticks in it.(C) “Look,” Harry heard one of them say, “the new Nimbus Two Thousand
19 —(...) fastest ever —(...)”(R) There were shops selling robes, shops selling telescopes and strange silver
20 instruments Harry had never seen before, windows stacked with barrels of bat spleens and eels’ eyes,
21 tottering piles of spell books, quills, and rolls of parchment, potion bottles, globes of the moon....(C)
(Rowling, 1997, 71-72)

Sample 3 (~325 words) – Excerpt from Chapter 16 – Through the Trapdoor:

1 “Which one will get you back through the purple flames?”(C)
2 Hermione pointed at a rounded bottle at the right end of the line.(C)
3 “You drink that,”(C) said Harry. “No, listen, get back and get Ron.(C) Grab brooms from the flying-key
4 room, they’ll get you out of the trapdoor and past Fluffy —(.) go straight to the owlery and send Hedwig
5 to Dumbledore, we need him.(R) I might be able to hold Snape off for a while, but I’m no match for him,
6 really.”(C)
7 “But, Harry —(.) what if You-Know-Who’s with him?”(C)
8 “Well —(.) I was lucky once, wasn’t I?” said Harry, pointing at his scar.(C) “I might get lucky again.”(C)
9 Hermione’s lip trembled, and she suddenly dashed at Harry and threw her arms around him.(C)
10 “Hermione!”
11 “Harry —(.) you’re a great wizard, you know.”(C)
12 “I’m not as good as you,” said Harry, very embarrassed, as she let go of him.(C)
13 “Me!” said Hermione. “Books! And cleverness! There are more important things —(:) friendship and
14 bravery and —(...) oh Harry —(.) be careful!”(R)
15 “You drink first,”(C) said Harry. “You are sure which is which, aren’t you?”(C)
16 “Positive,” said Hermione. She took a long drink from the round bottle at the end, and shuddered.(C)
17 “It’s not poison?” said Harry anxiously.(C)
18 “No —(.) but it’s like ice.”(C)
19 “Quick, go, before it wears off.”(R)
20 “Good luck —(.) take care —(.)”(R)
21 “GO!”(C)
22 Hermione turned and walked straight through the purple fire.(C)
23 Harry took a deep breath and picked up the smallest bottle.(C) He turned to face the black flames.(C)
24 “Here I come,” he said, and he drained the little bottle in one gulp.(C)
25 It was indeed as though ice was flooding his body.(C) He put the bottle down and walked forward; he
26 braced himself, saw the black flames licking his body, but couldn’t feel them —(.) for a moment he could
27 see nothing but dark fire —(.) then he was on the other side, in the last chamber.(R)
28 There was already someone there —(.) but it wasn’t Snape.(C) It wasn’t even Voldemort.(C)
(Rowling, 1997, pp. 286-287)



BACHELOR'S DEGREES

Art Education
Art Studio (Graphic Design)
Biology
Business Administration
and Economics
Chemistry
Commercial Music
Communication
Computer Information
Systems
Computer Science
Criminal Justice
Early Childhood Education
Elementary Education
Engineering Technology Management
English
History
Information Management
and Systems
Interdisciplinary Studies

Mathematics
Middle Level Education
Nursing
Physical Education
Political Science
Psychology
Secondary Education
Sociology
Special Education: Learning Disabilities
Spanish

MASTER'S DEGREES

Early Childhood Education
Elementary Education
Special Education: Visual Impairment
Informatics
Nursing

CERTIFICATION

Early Childhood Education
Elementary Education

Middle Level Education
Physical Education
Secondary Education
Special Education:
Learning Disabilities
Post-Baccalaureate
Certificate in Teaching
English to Speakers of
Other Languages

PRE-PROFESSIONAL PROGRAMS

Pre-Chiropractic
Pre-Dental
Pre-Engineering
Pre-Law
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Anticancer Effects of Blueberry and Pomegranate Extracts on the AGS Gastric Adenocarcinoma Cell Line

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Abstract — There is an abundance of research correlating diets rich in fruits and vegetables to the reduction or prevention of chronic diseases such as cancer and cardiovascular disease. This study focuses on the cytotoxic effects of blueberry and pomegranate extracts on gastric adenocarcinoma cells *in vitro* and examines the synergistic effect of the combined extracts on tumor cell proliferation and protein expression. Our results show that both extracts exhibited a potent cytotoxic effect on the AGS gastric adenocarcinoma cells, with the greatest effect observed from the combined treatment, suggesting a synergy between the blueberry and pomegranate extracts on AGS cell proliferation.

Keywords — adenocarcinoma, synergy, cytotoxic, antiproliferative, anticarcinogenic

Introduction

Today there is a plethora of information correlating diets rich in fruits and vegetables to the reduction or prevention of chronic diseases such as cardiovascular and neurodegenerative diseases, diabetes, obesity, and certain cancers. The disease-prevention properties of fruits and vegetables are attributed to the biological activities of the dietary fiber, vitamins, minerals and phytochemicals in the plants, however many studies suggest the protective effects of fruits and vegetables against chronic diseases are due in large part to the phytochemical content of the plants (Nichenametla & Taruscio, 2006). Experimentally, these plant compounds have been shown to exert a wide range of biological activities in both *in vitro* and *in vivo* systems, including antioxidant, anti-inflammatory and anticarcinogenic properties. In addition, certain plant compounds have been reported to have immunological, antiviral, antibacterial and estrogenic properties as well as antiproliferative and cytotoxic effects in human and animal tumor cell lines (Tuñon, Mediavilla, Campos, & Gallego, 2009).

The main aim of this ongoing research is to evaluate the *in vitro* effects of water extracts from blueberry and pomegranate on tumor cell viability and examine the synergistic effect of the combined extracts on tumor cell proliferation. Additionally, changes in gene expression are being monitored by

examining changes in the protein profiles of the fruit- and berry-treated cells compared to untreated control cells.

Materials and Methods

Blueberry and pomegranate extracts were prepared from fresh fruits acquired from local markets to examine the cytotoxic or cytotoxic effects of the extracts upon gastric adenocarcinoma cells. The AGS cell line was acquired from ATCC (ATCC® CRL-1739™) and cultured according to their recommended guidelines.

The fruit and berry extracts were prepared by blending 5 g of berries with 35 mL distilled water. The extract supernatants were sterilized through a 0.2 μm syringe filter and mixed with complete growth medium to give final concentrations of 5%, 15% and 25% blueberry, pomegranate, and blueberry/pomegranate extracts.

AGS cells were aliquoted in triplicate into a 96 well plate, yielding a final cell density of 2.5×10^4 cells per 100 μL per well of complete growth medium containing 0%, 5%, 15% and 25% blueberry, pomegranate, and blueberry/pomegranate extracts. The plate was incubated for 48 hours at 37°C in 5% CO₂. To measure cell viability, the CellTiter 96® Aqueous Non-Radioactive Cell Proliferation Assay was performed according to the manufacturer's protocol. Briefly, this is a colorimetric assay in which MTS, a tetrazolium compound, is converted into formazan, a product soluble in tissue culture medium, by dehydrogenase enzymes that are found in metabolically active cells. The absorbance of the formazan at 490 nm is directly proportional to the number of living cells in the sample.

Results

An *in vitro* assay was performed to detect the effects of blueberry and pomegranate extracts on the proliferation of the AGS gastric adenocarcinoma cell line. A synergistic effect between the blueberry and pomegranate extracts was also evaluated. The cells were cultured for 48 hours in the presence and absence of extract and their viabilities measured.

Changes in AGS cellular morphology, ability to adhere, and rate of proliferation were noted in all samples treated with the blueberry and pomegranate extracts (Figures 1 and 2 and Table 1). Both extracts exhibited an antiproliferative effect in a concentration-dependent manner. AGS samples treated with the blueberry extracts decreased in proliferation between 29.2% and 58.6% while samples treated with the pomegranate extracts decreased between 36.3% and 53.6% compared to untreated control samples. However, the largest antiproliferative effect was observed in AGS cells treated with a combination of blueberry and pomegranate extracts. This combination treatment resulted in a 72.4% decrease in proliferation at the highest concentration. Compared to the individual treatments with blueberry and pomegranate, this result suggests a possible synergism between the two fruits when combined together.

Conclusions

Numerous studies have demonstrated the anticancer properties of fruits and berries on tumor cell proliferation *in vitro* (Olsson, Gustavsson, Andersson, Nilsson, Duan, 2004), and the study from this laboratory supports these findings. Our results show that the blueberry and pomegranate extracts had a potent cytotoxic effect on the AGS cell line and contributed to the >50% reduction in proliferation observed in the treated cells. The greatest effect, however, was achieved using a combination of blueberry and pomegranate extracts, suggesting a possible synergism between the two fruits in producing an antiproliferative effect on AGS tumor cell growth *in vitro*.

Acknowledgements

This research is being performed with the support of the Biotechnology Department at Greenville Technical College and with the assistance of Dr. Kathy Romero.

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Tables & Figures

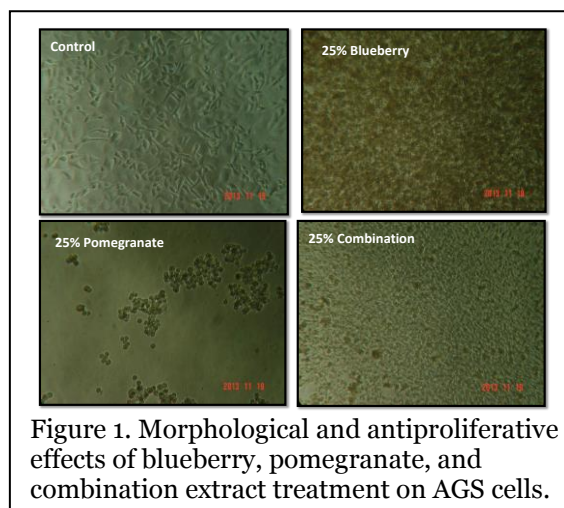


Figure 1. Morphological and antiproliferative effects of blueberry, pomegranate, and combination extract treatment on AGS cells.

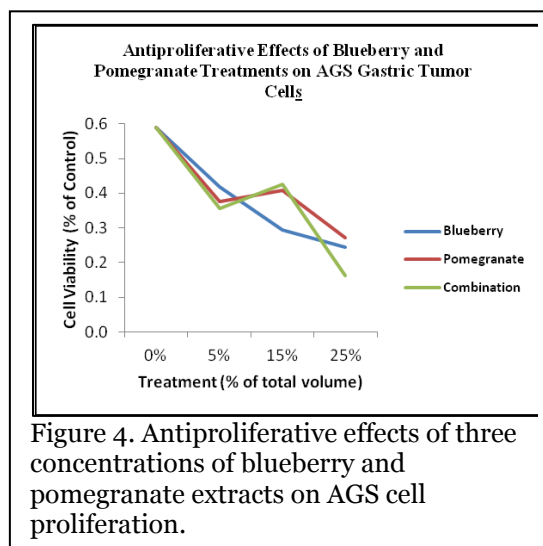


Figure 4. Antiproliferative effects of three concentrations of blueberry and pomegranate extracts on AGS cell proliferation.

Table 1. Percent decrease in AGS proliferation following extract treatment (B = Blueberry, P = Pomegranate, and C = Combination)

Treatment	B.	P.	C.
5%	-29.2	-36.3	-39.5
15%	-50.2	-30.8	-27.8
25%	-58.6	-53.6	-72.4

The effect of antifungal drugs on Antiphagocytic protein 1, a virulence factor of *Cryptococcus neoformans*

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Abstract — Previous studies have identified the virulence factor antiphagocytic protein 1 (*App1*) in *Cryptococcus neoformans* and shown it inhibits phagocytosis by alveolar macrophages by binding to complement receptors. *App1* becomes upregulated due to low environmental glucose levels in the host's lungs. Other factors that could potentially regulate *App1* have not been well studied. We decided to investigate whether the commonly used antifungal drugs amphotericin B and fluconazole affect *App1*. We found that *App1* is downregulated by amphotericin B and fluconazole in a dose-dependent manner continuously for up to 24 hours. *App1* expression is an important factor regarding the virulence of *C. neoformans* in hosts; our findings suggest that treatment of Cryptococcal infections might need to be further analyzed due to unique environmental influences on the fungal pathogen.

Keywords — fungal infection, meningitis, *App1*, antifungal

Introduction

Cryptococcus neoformans is an opportunistic fungal pathogen that causes life-threatening meningitis, with one million new cases occurring worldwide each year (Centers for Disease Control and Prevention [CDC], 2014). Cryptococcal infections primarily occur in immunocompromised hosts, as they do not have the ability to clear the yeast after inhalation. This population is increasing due to the HIV epidemic and medical immunosuppression due to transplantation and chemotherapy. Current drug regimens to treat Cryptococcal diseases last at least 6 months and include the drugs amphotericin B and fluconazole (CDC, 2014). *C. neoformans* enters the host through the respiratory system and has the ability to travel through blood and disseminate to various organs, most importantly, the brain. Following inhalation, the first line of defense against this pathogen is detection and phagocytosis by alveolar macrophages. In a healthy immunocompetent host, these cells will become “activated” and kill the pathogen; however, an immunocompromised host loses the ability to clear the yeast.

C. neoformans is surrounded by a thick capsule composed of the polysaccharides Glucuronoxylomannan and galactoxylomannan.

The capsule serves as a key virulence factor of the yeast, protecting the organism from phagocytosis and environmental stress (Zaragoza 2009). Another virulence factor produced by *C. neoformans* is antiphagocytic protein 1 (*App1*), which has the ability to inhibit phagocytosis. *App1*'s ability to inhibit phagocytosis is dependent on the presence of complement receptor 3 (Stano *et al.* 2009). The expression of *App1* is regulated by the environment; more specifically, upregulation of *App1* occurs in low glucose, 5% CO₂, and 37°C. This is significant because these are the conditions encountered in the host lung where the interaction between the yeast and alveolar macrophages takes place. Other virulence factors have also been found to be differentially expressed based on the yeast's environment; for example, melanin is upregulated during glucose starvation, capsule production is stimulated by iron deprivation and physiological CO₂ levels and mating is induced by nitrogen starvation (Williams and Poeta 2011). The purpose of this research is to test the effects antifungal drugs have on the expression of *App1*.

Materials and Methods

Strains, cultures and media

C. neoformans var. *grubii* serotype A H99 wild type (WT) and the Δ *app1* strains were kindly given to us by Maurizio Del Poeta, Stony Brook University. All *C. neoformans* strains were grown on yeast-peptone-dextrose (YPD) media containing 2% glucose.

Antifungal effect on App1

WT and Δ *app1* cultures were grown in YPD and the antifungal drugs fluconazole and amphotericin B (Sigma-Aldrich) were added to cultures at the indicated concentrations and then incubated at 30°C for 18-20 hours before RNA extraction. A time course experiment was also done by incubating cultures for 0, 1.5, 3, 6, and 24 hours with a concentration of 16.0 μ g/ml of fluconazole or 0.75 μ g/ml of amphotericin B. Following incubation with the drugs, RNA was extracted from the cells.

RNA extraction, cDNA Synthesis and Real-time PCR

Cells were washed twice with phosphate buffered saline (PBS) and then RNA was extracted using the RNeasy minikit from Qiagen. A total of 1µg of RNA was used to create cDNA using a superscript first-strand synthesis reverse transcription kit (Invitrogen, Carlsbad, CA). Real-time PCR was carried out in triplicate using the Bio-Rad CFX Connect Real Time Detection system. 25µL reaction mix was made using cDNA, syber green, 1µL each of forward and reverse primers and H₂O. The previously established reaction cycle used was (Williams and Poeta 2011), 95°C for 3 min for denaturation, 40 cycles of 95°C for 10 s for denaturation and 58°C for 45 s for annealing, 95°C for 1 min, and 58°C for 1 min, followed by a melting curve analysis starting at 58°C for 1 min and increasing 0.5°C each cycle for 78 cycles. Data was analyzed using the Bio-Rad CFX manager software and normalized to Actin. Melt curves showed a single product curve for each sample. Primers used included: App1F (5'-GAC GAT GAG TTG GAG GAA CC-3') and App1R (5'-CGA GAG CAG CCT CAA TGA C-3') for measuring App1 mRNA. Actin primers were ACTF (5'-CTG TCT TCC CTT CTA TTG TTG GTC-3') and ACTR (5'-CTC AAT GGG GTA CTT CAA GGT AAG-3').

Results

Amphotericin B and fluconazole downregulate App1 expression

App1 was downregulated by amphotericin B in a dose-dependent manner as shown in Figure 1A. App1 expression decreased approximately two fold when cells were treated with 0.25 µg /ml amphotericin B. The App1 expression in the 0.50 µg /ml concentration vs. 25 µg /ml concentration did decrease however, not at the magnitude of the control vs. 0.25 µg /ml. App1 expression was down regulated with a 50-fold decrease when treated with 1.0 µg /ml of amphotericin B. As shown in Fig. 1B, App1 expression also decreased in a dose-dependent manner when cells were treated with fluconazole. There was a small decrease in App1 expression when treated with 8 µg /ml fluconazole. App1 was further decreased approximately three-fold when treated with 16 or 32 µg /ml Fluconazole. As a negative, control Δapp1 cells were also grown and tested for App1 expression and as expected there was no detected expression (data not shown).

Antifungal drugs downregulate App1 expression quickly after treatment

As shown in figure 2A, amphotericin B downregulated App1 expression 2-fold at 1.5 hours,

at 3 hours App1 expression remained downregulated and at hours 6 and 24 down regulation was still occurring in a declining manner. In the fluconazole treatment group, App1 expression was also down regulated by 2-fold and continued to decrease after 3 and 6 hours (Figure 2B). At 24 hours after treatment App1 expression began increasing compared to the expression seen at earlier time points.

Conclusions

App1 is an important virulence factor in *Cryptococcus neoformans*, other studies have shown that its expression has an effect on the fungal pathogen's ability to survive and disseminate in the host. Factors influencing the regulation of App1 are not well known, this research was intended to help further investigate the factors that have the potential to regulate App1 expression. Two common antifungal drugs that have been used for many years include amphotericin B and fluconazole. Amphotericin B interferes with cellular membranes by binding to ergosterol, causing intracellular leakage, while fluconazole inhibits the essential enzyme Cytochrome P450, which is important for the production of ergosterol (Odds *et al.* 2003). We tested these drugs to see if they have any effect on the expression of App1. Our data shows that App1 is downregulated when amphotericin B or fluconazole are placed in *C. neoformans* cultures. The down regulating effects of these drugs both occurred in a dose dependent manner. During treatment with amphotericin B the decline in App1 expression occurred quickly and remained downregulated through 24 hours. Fluconazole had the same downregulating effect on App1, but expression started to increase at 24 hours, which could possibly be due to the drug losing potency. Fluconazole has a half-life of 30 hours in vivo, little is known on the in vitro half-life (Damle *et al.* 2011). In the previous study by Luberto *et al.* 2003, App1 expression was found to decrease survival of immune competent mice while increasing survival in mice with suppressed immune systems. It has been hypothesized these observations are due to the immune suppressed mice not having the ability to kill the cells once engulfed, leading to cells further growing within the macrophages. For this reason, inhibiting the process of phagocytosis was actually beneficial to these immunocompromised mice. This new discovery of the effect antifungal drugs have on App1 could be important when treating Cryptococcal infections as the effect of antifungal drugs may influence the genetic profile of the yeast. The host's immune system is another

important consideration when designing treatment plans. We also plan to test whether App1 has an effect on the susceptibility of *C. neoformans* to these antifungal drugs.

Our conclusions for this study indicate App1 expression in *Cryptococcus neoformans* is dynamically affected by the common antifungal drugs used to treat Cryptococcal disease. We found that App1 expression is down regulated by the antifungal drugs amphotericin B and fluconazole.

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Tables & Figures

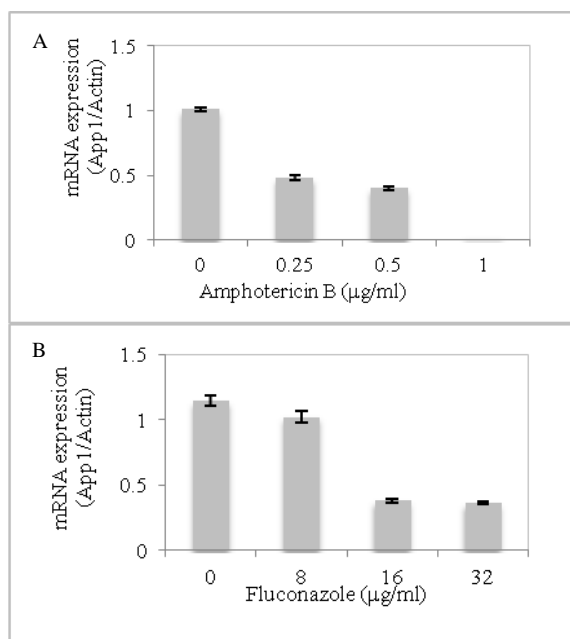


Figure 1: App1 mRNA expression when treated with antifungal drugs. A) Amphotericin B downregulates App1 in a dose-dependent manner. B) Fluconazole also down regulates App1 in a dose-dependent manner. mRNA expression was analyzed using real-time PCR. Data is representative of two individual dose-dependent experiments done in triplicate.

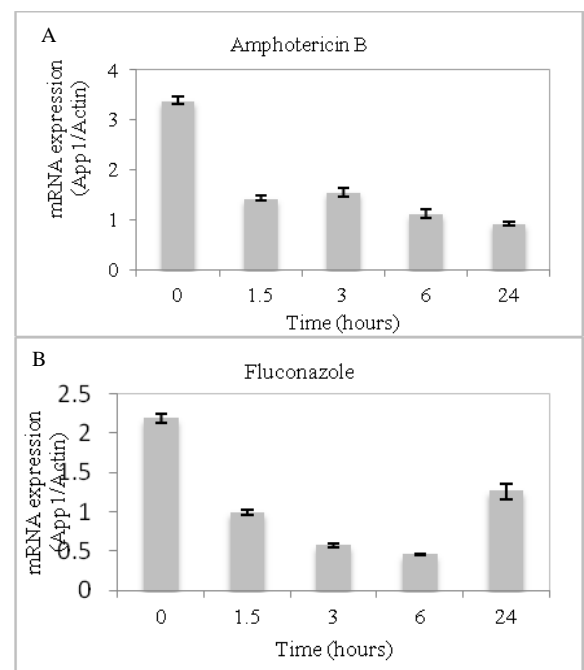


Figure 2: The effect of antifungal drugs on App1 expression over time. A) Amphotericin B downregulates App1 expression very quickly after treatment and the level of App1 expressions remains affected through 24 hours. B) Fluconazole affects App1 expression very quickly and it remains low until 24 hours. Data represents one real-time PCR experiment done in triplicate.

Identification of local plants using DNA barcodes

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Abstract — DNA barcodes present a simple, definitive way of identifying living organisms. Amplifying and sequencing a short, highly variable region of DNA, specimens can be either found in databases such as BLAST or recognized as a new species. The commonly chosen sequence of DNA for plant identification is *rbcL*, present in the chloroplast genome, which codes for a protein subunit essential in carbon fixation. This method was applied to ten local plants, randomly chosen and harvested from the banks of the Reedy River in Greenville, SC. DNA for identification was extracted and amplified, and the resulting sequence was run through BLAST. Unexpectedly, matches could not be found for 40% of the specimens gathered and tested.

Keywords — DNA barcodes, biotechnology, bioinformatics, data analysis

Introduction

As global climate change and the ever increasing rate of habitat destruction threaten organisms around the world, many of which are unknown, scientists are racing to identify and preserve disappearing species before it is too late. Only the identity of less than two million of an estimated five to fifty million plant and animal species have been found as the yearly rate of extinction has jumped to one hundred to one thousand species per million species. In the effort for quick identification, classical taxonomy methods fall short. Traditionally, classical taxonomy involves the careful handling of specimens to prevent damage to distinguishing features and the exact examination of the specimens for subtle anatomical differences. Such a method is difficult and demanding, and based on subjective judgment (Ratnasingham & Hebert, 2007).

DNA barcoding offers a solution to the need for quick and simple identification of species, and, in addition, is a more accurate method of analysis. This method is based on DNA's unique pattern and the use of computer databases such as Basic Local Alignment Search Tool (BLAST). With the use of DNA barcodes, different species can be accurately analyzed and identified (Ratnasingham & Hebert, 2007). The sequences used for DNA barcoding are found in mitochondrial or plastid DNA (primarily chloroplast) due to their high variability. For the

identification of plants, the standardized DNA barcode is the sequence of DNA of the *rbcL* gene in the chloroplast genome. The *rbcL* gene codes for the enzyme RuBisCo's large subunit (Ribulose-1,5-biphosphate carboxylase oxygenase), and is a short, highly variable region of DNA, making it ideal for species differentiation (Cooper, 2000). It offers high universality because of RuBisCo's part in the process of carbon fixation, which is a key reaction of life. It is possibly the most abundant protein known (Hollingsworth et al., 2009).

The research presented here used the method of DNA barcoding to identify ten local plants collected from the Greenville Technical College's main campus, alongside the Reedy River. The goal was to discern the differences in the plant specimens at a molecular level, therefore classifying them using an accurate and precise method that avoids the possible errors simple taxonomic methods can incur, and with the resulting data, begin characterizing the ecosystem of the tested area. It was hypothesized that the chosen specimens' DNA sequences would generate a strong match in the National Center of Biotechnology Information (NCBI) databases, due to the sight of harvest being in a heavily trafficked urban area.

Methods

For the DNA extraction process, one square inch of plant tissue was harvested from each of the ten plant specimens randomly chosen from a specific quadrat alongside the Reedy River. The samples were treated with nuclei lysis to dissolve the membrane bound organelles in the cells. Mechanical grinding was done to break down the cell walls, and more nuclei lysis was added to ensure complete membrane dissolution. The resulting solution was incubated at 65°C for fifteen minutes. The enzyme RNase was added to degrade the RNA and the sample was again incubated at 37°C, then at room temperature. Protein precipitation solution was added to the samples which were then vortexed and iced. Centrifugation to pellet the proteins and other remaining cell debris was done, and the supernatant containing the nucleic acids was retained and mixed with isopropanol. After another centrifugation, the

supernatant was discarded, and the pellet of nucleic acids was washed with 70% ethanol. Once more the samples underwent centrifugation and the resulting supernatant was discarded. DNA rehydration solution was introduced to dissolve the DNA pellet, and the DNA was incubated at 4°C to prevent DNA fragmentation by the nucleases still present in the sample.

To amplify the DNA for eventual sequencing, Polymerase Chain Reaction (PCR) was carried out using *rbcl* primer. To verify the presence of amplified DNA, a sample of the PCR product was tested through 2% agarose gel electrophoresis. When the presence of the amplified DNA in the PCR product was confirmed by staining and viewing under a UV transilluminator, the amplicons were sent to GENEWIZ DNA Sequencing Service in South Plainfield, New Jersey. When the sequencing data was returned, the results were analyzed with bioinformatics, using BLAST from NCBI.

Results

DNA extraction

The presence of extracted and amplified DNA from each plant specimen was confirmed using gel electrophoresis. Obvious bands for all specimens were present after gel staining, verifying that DNA had been successfully extracted and amplified.

Data analysis

Of the ten specimens sequenced, six found exact matches in the NCBI database. Specimen 9 resembled the possibilities found in the database to some degree, but many of the features were dissimilar. In addition, three of the specimens did not match genotype or phenotype to the possibilities generated by the database. Full results of the six positive identifications are detailed in Table 1.

Conclusions

The results of the research yielded positive matches for six of the ten specimens (60%) tested. The E-values (the number of BLAST hits expected to be seen by chance) given were 0.0, meaning that the value calculated was less than $1e-179$. Such a low probability of the number of BLAST alignments expected to be seen by chance suggests homology and confirms a close biological relationship. On a

macro level, the specimens matched phenotype with the generated matches. Such results support the original hypothesis of a well-documented ecosystem.

However, four of the ten specimens (40%) could not be identified. The high percentage of negative results is too great for random error, and casts doubt on the original assumptions. The four unknowns found no matches on either a molecular or phenotypic level. Higher E-values generated such as $3e-96$ suggests that the offered matches had a higher probability of happening by chance.

For plant specimens 2, 4, and 5, the possibilities were too wide and varied for any attempt to narrow down any specific properties of the tested specimens. However, the possible matches for specimen 9 primarily belonged to the genus *Persicaria*. Partial coding sequences in *rbcl* were matched between the specimen's sequence and various species within *Persicaria* with an E-value of 0.0. From these results, it can be inferred that specimen 9 belongs to *Persicaria*.

In light of 60% of the specimens yielding emphatic positive results, it can be tentatively hypothesized that the four unknown specimens' negative results are effect of the specimens not yet being sequenced and identified in the NCBI databases. This conclusion rejects the original assumption that all specimens had been identified. To confirm or deny these findings, further tests on specimens 2, 4, 5, and 9 are needed.

Acknowledgements

This research was performed with the support of the Biotechnology Department at Greenville Technical College and with the assistance of Dr. Kathy Romero as an advisor, as well as the assistance of GENEWIZ, Inc. in their DNA sequencing services.

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Tables & Figures

Table 1. Identity of specimens tested

	Plant Species	Alignment Length	Bit Score	E-value	Mismatches
Specimen 1	<i>Commelina communis</i>	555	982	0.0	3
Specimen 2	Unknown	-	-	-	-
Specimen 3	<i>Pithecellobium clypearia</i>	572	1005	0.0	4
Specimen 4	Unknown	-	-	-	-
Specimen 5	Unknown	-	-	-	-
Specimen 6	<i>Impatiens capensis</i>	569	1018	0.0	0
Specimen 7	<i>Acalypha rhomboidea</i>	558	1002	0.0	1
Specimen 8	<i>Phytolacca Americana</i>	572	1016	0.0	2
Specimen 9	Unknown	-	-	-	-
Specimen 10	<i>Phytolacca Americana</i>	572	1032	0.0	0



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Action Rules Discovery of Lowest Cost

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Abstract — A knowledge discovery system is prone to yielding plenty of patterns, presented in the form of rules. Sifting through to identify useful and interesting patterns is a tedious and time consuming process. An important measure of interestingness is: whether or not the pattern can be used in the decision making process of a business to increase profit. Hence, actionable patterns, such as action rules, are desirable. Action rules may suggest actions to be taken based on the discovered knowledge. In this way contributing to business strategies and scientific research. The large amounts of knowledge in the form of rules presents a challenge of identifying the essence, the most important part, of high usability. We focus on decreasing the space of action rules through generalization. In this paper, we propose an improved method for discovering short descriptions of action rules. The new algorithm produces summaries by maximizing the diversity of rule pairs, and minimizing the cost of the suggested actions.

Keywords — Data Mining, Knowledge Discovery in Databases, Action Rules

Introduction

Data mining, or knowledge discovery, is frequently referred to in the literature as the process of extracting interesting information or patterns from large databases. There are two major directions in data mining research: patterns and interest. The pattern discovery techniques include: classification, association, and clustering. Interest refers to the pattern applications in business, or other organizations, being useful or meaningful [1].

Since the pattern discovery techniques often generate large amounts of knowledge, they require a great deal of expert effort to post-process the mined results. Therefore, one of the central research problems in the field relates to reducing the volume of the discovered patterns, and selecting appropriate interestingness measures.

These measures are intended for selecting and ranking patterns according to their potential interest to the user. Good measures also allow the time and space costs of the mining process to be reduced. Although much work has been conducted in this area, so far there is no widespread agreement on a formal definition of interestingness in this context. Based on the variety of definitions presented to-date, interestingness is perhaps best treated as a broad concept that emphasizes:

conciseness, coverage, reliability, peculiarity, diversity, novelty, surprisingness, utility, and actionability [2]. In this work we focus on actionability and diversity.

Related Work

In the paper by Ras and Wieczorkowska [3], the notion of an action rule was introduced. The main idea was to generate, from a database, special type of rules which basically form a hint to users showing a way to re-classify objects with respect to some distinguished attribute (called a decision attribute). Values of some of attributes, used to describe objects stored in a database, can be changed and this change can be influenced and controlled by the user. However, some of these changes (for instance "profit") cannot be done directly to a decision attribute. In addition, the user may be unable or unwilling to proceed with the actions.

For this reason Tzacheva and Ras [4] introduce the notion of a cost and feasibility of an action rule. They suggest a heuristic strategy for creating new action rules, where objects supporting the new action rule also support the initial action rule but the cost of reclassifying them is lower or even much lower for the new rule. In this way the rules constructed are of more interest to the users.

Extended action rules, discussed in Tsay and Ras [5], form a special subclass of action rules. They construct them by extending headers of action rules in a way that their confidence is increased. The support of extended action rules is usually lower than the support of the corresponding action rules.

Tzacheva [2] suggested removing the high cost rules, when creating summaries, in order to additionally decrease the space of action rules. However, did not discuss how the cost will change, or how it will be computed when creating summaries. In this work, we suggest an average approach to computing the cost, which leads to cost decrease as we go up in the generalization hierarchy.

Summaries of Action Rules

We partition a supporting set of action rule schemas into classes, each one generating a corresponding action rule.

We adopt this strategy as the first step in our proposed method, and as an approach which allows for mining action rules from scratch [1, 9, 11], i.e. directly from the database without using pairs of classification rules. We therefore use an exhaustive method that would supply us with all important rules as a start.

We are constructing the actions rules, by "grabbing" supporting objects into action rules schema, directly from the database. The next step is to cluster action rules into groups, i.e. groups of rules, which are similar. Such grouping would allow us to combine the similar rules together later in the process.

We use a grid-based method, STING: STatistical INformation Grid [13]. We choose this method because of its advantage of fast processing time and its typical independence of the number of objects (scales well).

The spatial area is divided into rectangular cells. There are usually several levels of such cells, which form a hierarchical structure. Each cell at high level is partitioned into a number of smaller cells in the next lower level. Statistical information of each cell is calculated and stored beforehand. When finished examining the current layer, proceed to the next lower level. Repeat this process until the bottom layer is reached.

Generalization of the data involves replacing low-level or "primitive" (raw) data with higher-level concepts through the use of concept hierarchies. For example, categorical attributes, like {street}, can be generalized to higher-level concepts, like {city} or {country}. Similarly, values of numerical attributes, like {age}, may be mapped to higher-level concepts, like {young}, {middle-aged}, and {senior}.

In this way, we form compact descriptions of raw data at different concept levels, which are called {summaries}. For that purpose, in this work we assume that attributes are hierarchical.

Since we have clustered the action rule space, we have end up with n clusters, where each cluster contains a set of similar rules. Next, we will generalize the attributes of these rules to create a summary, or a higher-level action rule. Each such summary will cover a certain portion of the action rule space; and, it may go outside its cluster boundary or overlap with another summary.

We perform a generalization on every attribute.

Cost of Action Rules

Typically, there is a cost associated with changing an attribute value from one class to another - more desirable one. The cost is a subjective measure, in a sense that domain knowledge from the user or experts in the field is necessary in order to determine the costs associated with taking the actions. Costs could be monetary, moral, or a combination of the two.

For example, lowering the interest percent rate for a customer is a monetary cost for the bank; while, changing the marital status from 'married' to 'divorced' has a moral cost, in addition to any monetary costs which may be incurred in the process. Feasibility is an objective measure, i.e. domain independent. According to the cost of actions associated with the classification part of action rules, a business user may be unable or unwilling to proceed with them. The definition of cost was introduced by Tzacheva and Ras [4].

Once we have created the higher-level action rules, or the action rule summaries, we may examine the cost associated with each summary. Clearly, the summaries of low cost are more actionable, i.e. easier for the user to accomplish. Therefore, they are more interesting.

Hence, if the summary has high cost, we may disregard it as being of low interest to the user. In this way, we would further decrease the space of the mined action rules. In addition, it is possible that if the summary is not interesting, then we may make assumptions about the interestingness of the whole cluster, from which the summary was extracted. However, in order to make such determinations, the correlations of the attributes will need to be taken into consideration. Little, to no work has been done examining the correlations of attributes with action rule discovery.

Conclusions

Concluded in this work, we present an improved method to decrease the space of action rules, through the creation of summaries, and the use of hierarchical attributes.

The new algorithm produces summaries by maximizing the diversity of rule pairs, and minimizing the cost of the suggested actions. We, therefore, provide means for reducing the volume of the mined results, and supply the user with short general descriptions of high interest actionable knowledge.

With the proposed algorithm in this work, we extend diversity of action rule summaries by choosing to merge the pair of two rules, which has the maximum diversity.

We consider the cost of action rule summaries, as well. The summaries of low cost are more actionable, i.e. easier for the user to accomplish, and therefore more interesting. Tzacheva [14] disregarded the ones with high cost as being of low interest to the user. In this work, we suggest an average approach to computing the cost, which leads to cost decrease as we go up in the generalization hierarchy.

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Modeling Innovation with BACUP

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Abstract – Many definitions and models of innovation have been developed each focusing on a particular point of view and therefore lacking general applicability. The model an author uses is usually dictated by his or her domain of knowledge making it difficult to contrast and compare tools, techniques, methodologies and outcomes. This paper introduces the BACUP model, a new model of innovation based on combining multiple points of view into a single domain-independent metric. Expressed on a five-axis radar plot, the BACUP model provides easy visualization of key ideas in innovation science.

Keywords – innovation, models of innovation, management of innovation, computer-aided innovation

Introduction

At the heart of innovation is the notion of the existing being replaced by the new. (Drucker, 1985) describes innovation as a response to perceived opportunities. Opportunities are always present because market conditions, industries, the needs of users, demographics, and customer behavior change over time. Organizations are continually looking for niches in a market to fill and do so by modifying and improving existing systems, products, and services or creating new ones. Invariably, the new system, product, or service replaces the old in continuing cycles of improvement (Schumpeter, 1943) described as *creative destruction*. Some innovations come in the form of evolutionary improvements while others are revolutionary in nature representing discontinuous leaps forward. (Christensen, 1997) identifies *sustaining innovations* as being those incrementally improving a technology thereby perpetuating a market and *disruptive innovations* as being those creating an entirely new market.

It seems there are as many definitions of innovation and models of innovation as there are authors willing to write about the topic. Each author tends to focus their definitions and models on aspects of an innovation based on their domain of discourse. It is difficult to contrast and compare the work by different people because there exist no domain-independent way to describe an innovation and its impact.

This paper presents a new model of innovation, called the BACUP model, combining the characterization of an innovation from five

different viewpoints: *business, applied innovation, creativity, unmet user needs, and problem solving* into a single metric. The five dimensions of the model represent a multi-disciplinary description of an innovation and its impact and therefore provide a common frame of reference researchers from any discipline can use to represent their ideas.

The BACUP Model

Systems, and therefore innovations, do not exist in isolation. Systems are situated within complex business, market, social, cultural, and technical environments. People place value on characteristics differently based on their role, knowledge base, and relationship to the system. To survey various definitions of innovation, (Carpenter, 2010) questioned a number of people in diverse organizations and roles. The resulting compilation forms a multi-disciplinary description of innovation. Five distinct viewpoints emerged from the survey: *business, applied invention, creativity, unmet user needs, and problem solving*. Presented here is the notion that *all* of these viewpoints must be considered to get a complete understanding of the viability of an innovation. The BACUP model combines the five viewpoints into a single metric. To visualize the BACUP metric, each of the five viewpoints is assigned to an axis of a radar plot as shown in Figure 1.

An innovation is scored in each dimension on a scale from 0 to 1 where a lower rating indicates the innovation lacks significantly. A higher number indicates the innovation excels in that dimension. To score an innovation in the five dimensions of the BACUP model, one asks the following questions about the innovation being analyzed:

Business

Is the innovation viable in a business sense? What is the market potential for the innovation? Can the market support the entrance of the innovation? Does the innovation provide new intellectual property such as patents, trademarks, copyrights, best practices, etc? Does the innovation change the landscape in businesses and markets? Does the innovation result in a new product or service or does it replace an existing product or service?

Applied Invention

How well is the innovation focused to the perceived need or problem at hand? Is the innovation practical? Can the innovation be commercialized? How well does the innovation integrate into the existing system? Does introduction of the innovation upset the product, system, or practice?

Creativity

What is the degree of novelty in the innovation? How much does the innovation challenge mainstream thinking and behavior? How different is the innovation from the current state of the art or practice?

Unmet User Needs

How well does the innovation satisfy user's unmet needs? Does the innovation meet a need not yet realized in the market? Does the innovation offer tangible value for users? Does the innovation make something available to more users previously not having access to the product or service?

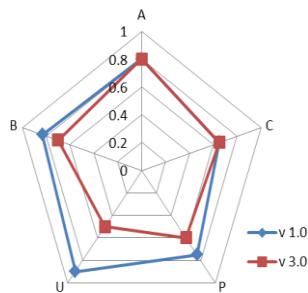
Problem Solving

How well does the innovation solve a problem with the existing system? Is the solution viable in terms of economy, manufacturability, sustainability, etc.

Examples

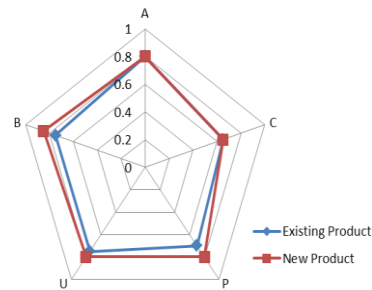
Drucker's Realization of Opportunities

The latest version, Version 3.0, of the product scores more poorly in meeting user needs than version 1.0 of the product. Drucker's model of innovation predicts a competing product will be developed to exploit this opportunity in the market.



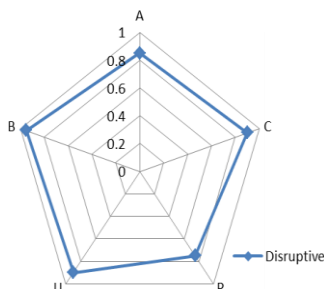
Christensen's Sustaining Innovations

The new product makes small gains in business, meeting user needs, and problem solving. This is the signature of a sustaining innovation –an incremental improvement of an existing product.



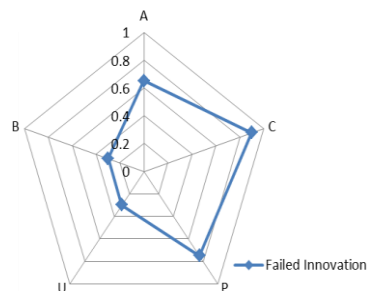
Christensen's Disruptive Innovations

For an innovation to be a truly disruptive product, creating an entirely new market, it must not only be a creative solution to a problem users face but also be a valid business solution in terms of manufacturing, distribution, marketing, etc. Therefore, a disruptive innovation scores highly in each dimension.



Failed Innovation

The innovation represented here is a very creative new idea and interesting solution to a problem but it fails to satisfy user needs (U axis) and is not easy to produce, market, and sell (B axis). Therefore, this innovation is probably not going to be successful since it has several major deficiencies.



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Tables & Figures

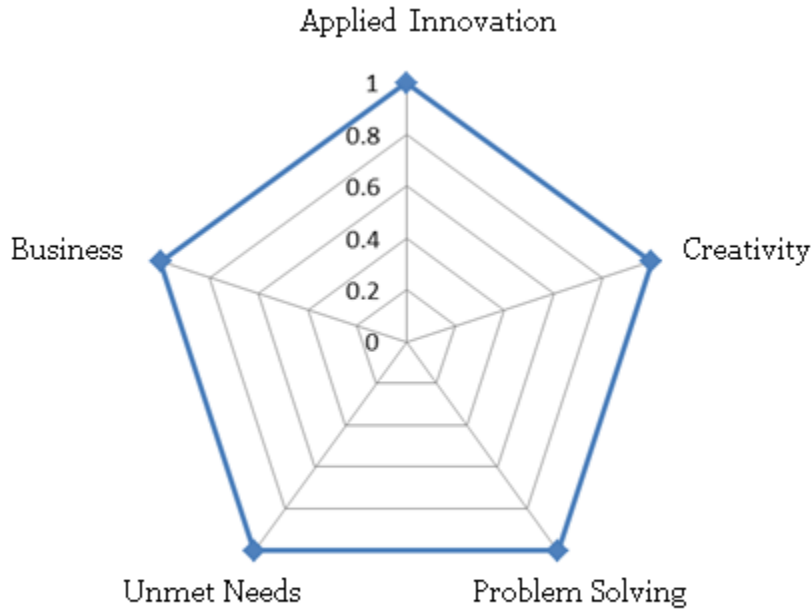


Figure 1 – The BACUP model of innovation scores innovations on five multi-disciplinary dimensions.

Incorporating Disruptive and Incremental I-TRIZ Innovation into Six Sigma

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Abstract – Six Sigma is a set of tools and techniques for continual process improvement. The DMAIC methodology seeks to improve the quality of process outputs by incrementally improving an existing process. The DMADV methodology seeks to create new products or new processes. I-TRIZ is a set of methodologies facilitating innovative solutions to problems based on concepts gleaned from the study of millions of patents. The IPS methodology facilitates incremental innovations and the DE methodology facilitates large-scale, disruptive, innovations. This paper discusses the nature of incremental and disruptive innovation and shows how to incorporate I-TRIZ methodologies into Six Sigma.

Keywords – innovation, models of innovation, management of innovation, computer-aided innovation, six sigma

Introduction

Drucker (1985) describes innovation as a response to perceived opportunities. Opportunities are always present because market conditions, industries, the needs of users, demographics, and customer behavior change over time. Organizations are continually looking for niches in a market to exploit and do so by either incrementally improving existing systems, products, and services or creating entirely new ones. Some innovations come in the form of evolutionary, incremental improvements while others are revolutionary in nature representing discontinuous leaps forward. (Christensen, 1997) identifies these as *sustaining innovations* and *disruptive innovations* respectively.

Six Sigma is a set of techniques and tools for process improvement seeking to improve the quality of process outputs by identifying and removing the causes of defects and minimizing variability in manufacturing and business processes. Six Sigma projects follow two project methodologies: DMAIC is used to improve an existing product or business process and DMADV used to create a new product or process (iSixSigma, 2013). By and large, DMAIC produces sustaining innovations and DMADV produces disruptive innovations. TRIZ (pronounced “trees”) is an acronym for the Russian phrase “Teoriya

Resheniya Izobretatelskikh Zadatch” or “The Theory of Inventive Problem Solving” and is the name of an effort dating back to 1946 to understand the evolution of technological systems. One group of TRIZ researchers based in the United States has developed a set of methodologies for innovation called I-TRIZ (for “Ideation TRIZ”). Two of these methodologies are IPS (Inventive Problem Solving) and DE (Directed Evolution). IPS is used to develop incremental, sustaining innovations and DE is used to develop disruptive innovations.

This paper explores the idea of incorporating the IPS and DE methodologies from I-TRIZ into Six Sigma’s DMAIC and DMADV methodologies.

Six Sigma Methodologies

Each Six Sigma project carried out within an organization follows a defined sequence of steps and has quantified value targets, for example: reduce process cycle time, reduce pollution, reduce costs, increase customer satisfaction, and increase profits. The steps in the DMAIC and DMADV methodologies are:

DMAIC

- Define the voice of the customer and their requirements, project goals
- Measure key aspects of the current process and collect relevant data
- Analyze verify cause-and-effect relationships, seek out root cause of the defect
- Improve optimize the current process based upon data analysis
- Control ensure any deviations from target are corrected before they result in defects

DMADV

- Define design goals consistent with customer demands and the enterprise strategy
- Measure characteristics critical to quality, capabilities, process, risks
- Analyze develop and design alternatives
- Design improved alternative, best suited per analysis in the previous step
- Verify pilot runs, implement production process, hand it over

I-TRIZ Methodologies for Incremental and Disruptive Innovation

IPS is a generic methodology enabling practitioners to innovate on demand about any type of system in any domain. At the heart of IPS is a database of over 400 operators (Fulbright, 2011). Each operator is an innovative concept gleaned from the study of over two million patents by TRIZ scholars. In the *scoping* and *analysis* phases, several abstract descriptions designed to model the system from different perspectives are created. Ultimately, a graphical representation of the problem domain known as the problem formulator (PF) diagram is created capturing relationships between desirable and undesirable characteristics of the system and exposing areas of the system most likely to benefit from an incremental change (an innovation). The PF diagram is used in conjunction with the *operator database* to generate dozens of potential innovative solution ideas. The IPS methodology is shown in Figure 1.

DE replaces the guesswork of market and technical forecasting with a strategic decision-making process based on observed patterns in the evolution of technological systems (Zlotin, 2001). Instead of trying to guess what the future is going to look like, DE allows one to *select* a future to implement by inventing it before it would otherwise occur naturally. This is done by first determining the historical trends present in the domain, matching it with known patterns, then projecting that into the future. Directed Evolution (DE) is intended to facilitate long-term innovations. The DE methodology is shown in

Figure 2.

Incorporating I-TRIZ into Six Sigma

IPS is best at creating incremental, sustaining innovations and DE is best for generating disruptive innovations. We can now envision how to incorporate I-TRIZ methodologies into Six Sigma. The IPS methodology is a replacement for the *Analyze* and *Improve* phases of the DMAIC methodology in Six Sigma as shown in Figure 3. The DE methodology is a replacement for the *Analyze* and *Design* phases in DMADV as shown in Figure 4.

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Figures

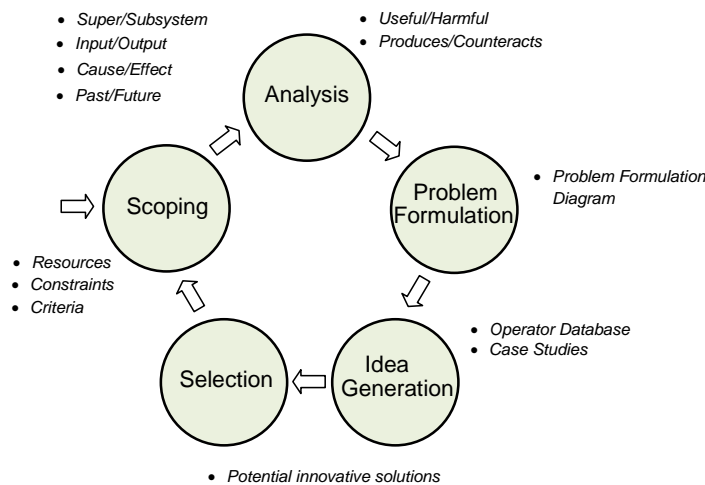


Figure 1. Innovative Problem Solving (IPS) from I-TRIZ

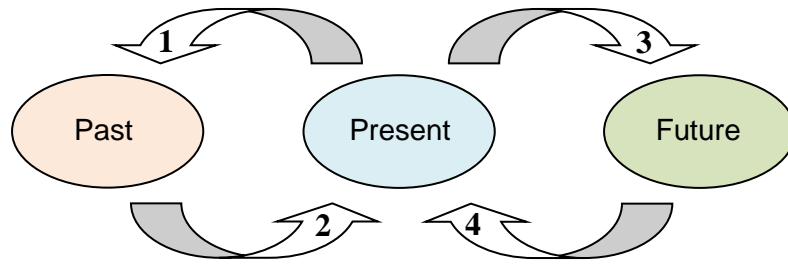


Figure 2. Directed Evolution Methodology (DE) from I-TRIZ

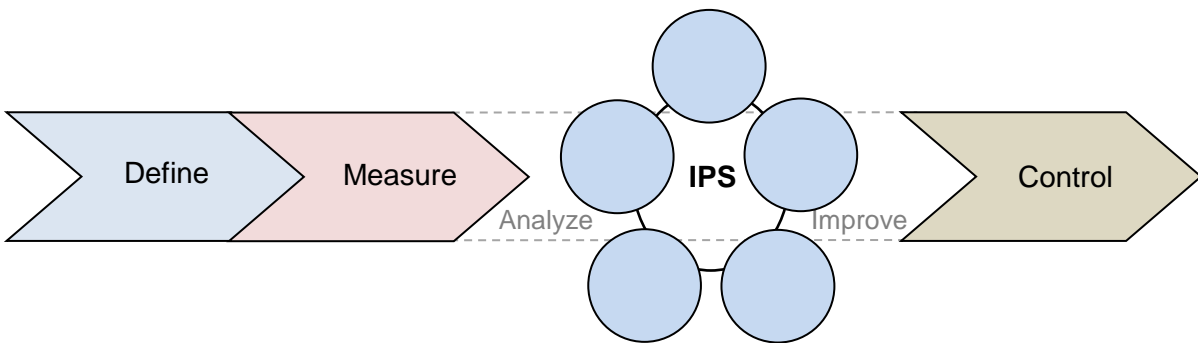


Figure 3. DMAIC with IPS used to generate sustaining innovations

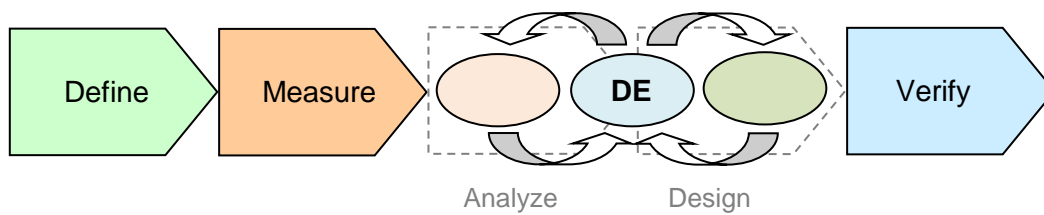


Figure 4. DMADV with DE used to generate disruptive innovations