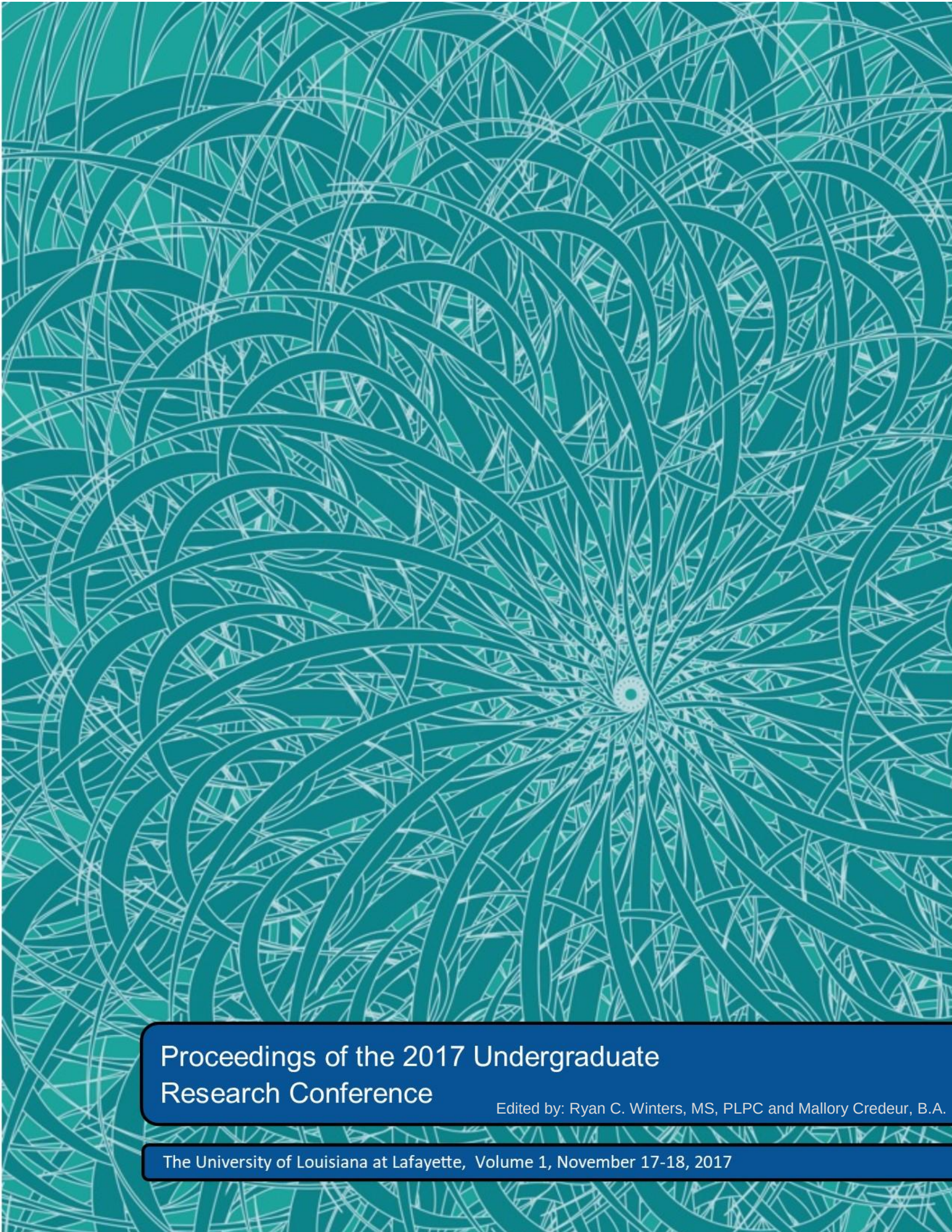

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Sending Students into Bars for Science: Learning about the Impact of Alcohol on Bystanders

Amy L. Brown and Melanie Schanke

Department of Psychology
University of Louisiana at Lafayette

Abstract

The bystander approach is a promising strategy for preventing sexual violence (Banyard, 2011; McMahon, 2015; White House Task Force to Protect Students from Sexual Assault, 2014). Because sexual violence often occurs in alcohol-rich contexts (Lawyer et al., 2010; Testa & Cleveland, 2017), it is likely that bystanders to sexual violence will often be under the influence of alcohol. However, little is known about the effects of alcohol intoxication on bystanders to situations involving risk for sexual violence. To explore how naturalistic alcohol intoxication can impact perceptions of sexual assault risk and hypothetical willingness to intervene, our research team, led by one undergraduate student, visited a bar, a music festival, and a football game armed with survey packets and a breathalyzer. Participants (*N* = 106) read one of two scenarios describing risk for sexual assault and responded to questions assessing perceived risk and willingness to intervene. Next, BAC was measured and recorded. Participants were compensated with food vouchers. The experience taught students about research design, integrity, and ethics. Researchers and participants enjoyed the experience and valuable information was learned. Specifically, perceptions of risks and willingness to intervene were high in both scenarios, and were uncorrelated with BAC. This implies that young adults are able to recognize risk for violence and willing to intervene even when intoxicated.

Introduction

This paper presents the results of a study that was funded by Undergraduate Research Mini-Grant funds in 2015-2016. It also reflects on the experience of doing hands-on social science research with undergraduate students.

The Problem of Sexual Violence Among Young Adults

Sexual assault is a significant social, legal, and health concern that is particularly prevalent among young-adult (ages 16-24) women (Bureau of Justice Statistics, 2011). Large national studies indicate that between 11% and 15% of young women have experienced a completed rape (Kilpatrick et al., 2007; Koss et al., 1987; Tjaden & Thoennes, 1998). As many as 50% of college women have experienced some form of sexual victimization (Koss et al., 1987, Messman-Moore & Brown, 2006). Alcohol plays a prevalent role in sexual assaults, particularly those occurring among college students (Testa & Livingston, 2009).

In an attempt to combat the widespread problem of sexual assault among college students, universities, researchers, and activists have instituted various sexual assault prevention programs. Programs may be targeted toward women, toward men, or to both genders. Typically, these programs provide information about sexual assault, including facts

that challenge rape myths (stereotypical beliefs about rape); some programs aim to promote empathy with victims or teach skills to reduce sexual assault risk (Anderson & Whitson, 2005). Reviews indicate that educational programs appear to have some success at improving knowledge about rape and reducing rape-supportive attitudes on campus, but show limited success at changing actual behaviors or at reducing the incidence of sexual assault (Anderson & Whitson, 2005; Breitenbecher, 2000). Self-defense based programs aimed at women have been shown to be more successful at improving self-efficacy and assertiveness but still have not been consistently shown to actually reduce the incidence of sexual victimization (Lonsway et al., 2009; Orchowski, Gidycz, & Raffle, 2008).

Perhaps because of the limited success of sexual assault prevention programs that focus on teaching young adults how to avoid becoming victims or perpetrators of sexual assault, programs are increasingly incorporating an approach based on empowering bystanders to confront and prevent sexual assault (Banyard, Plante, & Moynihan, 2004; Berkowitz, 2002; Foubert, Langhinrichsen-Rohling, Brasfield, & Hill, 2010; Katz, 1995; McMahon, Postmus, & Koenick, 2011; Potter, Moynihan, Stapleton, & Banyard, 2009). There are a number of reasons to target bystanders for sexual assault prevention efforts. Young adults typically operate under an illusion that they are invulnerable to negative events, but will readily admit that negative events can happen to others (Weinstein, 1980). Consequently, young adults may be more open to monitoring their peers' behavior than their own behavior (Banyard et al., 2004). Furthermore, a focus on bystanders not only targets potential offenders, but also empowers the more responsible, non-offending audience members (Banyard et al., 2004; Berkowitz, 2003). Because sexual assault among college students often occurs in a social context (e.g., parties; Lawyer, Resnick, Bakanic, Burkett, & Kilpatrick, 2010; Testa & Cleveland, 2017), it is reasonable to expect that there are often witnesses, at least to the behaviors leading up to a potential sexual assault, who could intervene. Research indicates that bystander education programs can be effective at improving bystander attitudes and behaviors (Banyard, Moynihan, & Plante, 2007; Banyard, Moynihan, & Crossman, 2009; Senn & Forrest, 2016).

Bystander Intervention Against Sexual Violence

Social psychological research on bystander intervention began in the aftermath of the 1964 murder of Kitty Genovese in New York City, in which dozens of neighbors heard her cries but failed to intervene. Hundreds of studies were conducted to better understand why bystanders often fail to intervene in emergencies, and under what conditions they may be more likely to intervene. One of the more influential models that emerged from this line of research was Latané and Darley's (1970) situational model of bystander intervention. Latané and Darley described a series of steps that a person must progress through before they intervene in an emergency situation. Before bystanders will intervene, they must (1) notice the event in the first place, (2) identify it as a situation in which intervention is necessary, (3) take personal responsibility for intervening, (4) decide how to respond, and finally (5) implement that decision.

Other models of bystander intervention have expanded upon Latané and Darley's (1970) situational model. The arousal:cost-reward model (Dovidio, 1984) proposes that emotional and motivational factors also play important roles in helping. According to the arousal:cost-reward model, witnessing another person in need causes arousal, and arousal leads to increases in helping. Factors that can increase arousal include higher levels of danger faced by the victim and feelings of empathy toward the victim. However, bystanders are also sensitive to the costs associated with helping. Costs of helping can include time, effort, and potential danger to the

bystander. Helping will be most likely when arousal is high and costs are low; helping will be least likely when arousal is low and costs are high.

Recent research has found that elements of both the situational model and the arousal:cost-reward model are relevant in bystander intervention against sexual violence. Barriers to intervention in this context include failure to notice potential sexual assault, failure to identify situations as needing intervention, and failure to take responsibility for intervening (Burn, 2009; Koelsch, Brown, & Boisen, 2012). In qualitative research on bystander intervention against sexual violence, participants reported being aware of the potential costs of intervening, such as fear for one's personal safety after confronting an aggressive male and embarrassment after interfering with private relationship matters, and reported less willingness to act in situations involving high costs (Koelsch et al., 2012). Other variables shown to be related to bystander intentions (stated willingness to intervene) and/or bystander behaviors (actual experience with intervention) in the domain of sexual violence include confidence in one's ability to engage in prosocial bystander behaviors (Banyard, 2008; Banyard & Moynihan, 2011) and empathy for rape victims (Katz, Pazienza, Olin, & Rich, 2015; McMahon, 2010).

Research on bystander intervention against sexual violence has focused primarily on intrapersonal variables, such as empathy, perceived ability to intervene, and perceived costs. Situational variables have also been studied, including the number of other bystanders present and the relationship between victim and perpetrator (Banyard, 2011; Latané & Nida, 1981). One situational variable that has received less attention in previous work on bystander intervention in the context of sexual violence, but which likely plays an important part in determining willingness to intervene and the effectiveness of any intervention decisions, is the degree of alcohol intoxication of bystanders.

The Effects of Alcohol on Bystanders

The majority of sexual assaults among college students are alcohol- or drug-facilitated, and these assaults occur most frequently at house parties, followed by bars and restaurants (Lawyer et al., 2010). This implies that opportunities for bystander intervention against sexual violence often occur in social situations, in which bystanders and targets have been drinking.

According to alcohol myopia theory (Steele & Josephs, 1990) alcohol interferes with people's ability to process conflicting cues, with the result that people tend to act on whatever cues are most salient. Typically, this leads to riskier behavior than people would engage in while sober, as impelling cues tend to be more salient than inhibitory cues (MacDonald, Fong, Zanna, & Martineau, 2000; Steele & Josephs, 1990; Steele & Southwick, 1985). In situations in which there is subtle risk for sexual assault, intoxicated observers may have difficulty recognizing cues suggestive of danger or sexual assault. In support of this notion, experimental studies of perceptions of sexual assault show that intoxication is associated with more acceptance of sexual violence, less sensitivity to cues signaling sexual violence, and less empathy for victims (Abbey, Buck, Zawacki, & Saenz, 2003; Davis, Stoner, Norris, George, & Masters, 2009; Gross, Bennett, Sloan, Marx, & Juergens, 2001; Johnson, Noel, & Sutter-Hernandez, 2000; Norris, George, Davis, Martell, & Leonesio, 1999; Testa, VanZile-Tamsen, Livingston, & Buddie, 2006). This research suggests that intoxicated observers may be less willing to intervene against potential sexual violence, possibly as a result of decreased perceptions of risk or empathy toward a potential victim. In other domains, alcohol intoxication has been shown to be negatively related to intervening against drunk-driving (Newcomb, Rabow, Hernandez, & Monto, 1997), and negatively related to concern for and ability to recognize symptoms of alcohol poisoning (Oster-Aaland, Lewis, Neighbors, Vangsness, & Larimer, 2009). One recent study

suggested that, in alcohol-rich contexts such as parties, ambiguity regarding risk is likely to prevent bystanders from intervening against sexual violence (Pugh, Ningard, Vander Ven, & Butler, 2016).

However, when strong situational or dispositional factors encouraging intervention are salient, intoxication may actually increase the likelihood of bystander intervention intentions, as cues inhibiting intervention (perceived costs) are not fully processed (Hirsh, Galinsky, & Zhong, 2011). In an investigation of alcohol intoxication and general helping behavior, Steele, Critchlow, and Liu (1985) found that intoxication increased helping in situations with competing cues. In an unpublished study, participants were asked to recall how intoxicated they were during recent experiences of (a) intervening against sexual violence and (b) failing to intervene when given the opportunity (Brown, 2013). Intoxication levels were higher during intervention acts than during missed opportunities, but this was only the case for people who reported both intervention behaviors and missed opportunities. Although this finding suggests that intoxication can facilitate bystander intervention, typical drinking behavior was uncorrelated with intervention acts and positively correlated with missed opportunities, suggesting that heavier drinkers have more opportunities to intervene, perhaps by virtue of their attendance at parties and bars, but do not always act on those opportunities. Finally, other research (Orchowski, Berkowitz, Boggis, & Oesterle, 2016; Fleming & Weirsma-Mosely, 2015) has found that men who drink more report lower intentions to intervene in the context of sexual violence than men who drink less. However, this effect was only found among men who imagined intervening against a known perpetrator; typical drinking had no impact on women or people who imagined intervening against a stranger (Fleming & Weirsma-Mosely, 2015). Thus, it is important to better understand the relationship between intoxication and bystander intervention, particularly regarding when and how intoxication either encourages or inhibits intervention.

There are at least four mechanisms that could account for the relationship between levels of intoxication and intention to intervene. Theoretically and empirically, willingness to intervene is related to (1) perceptions of danger and concern for a victim, (2) perceived costs of intervening, and (3) perceived responsibility for intervening (Banyard & Moynihan, 2011; Burn, 2009; Dovidio, 1984; Latané & Darley, 1970). Alcohol intoxication could impact any or all of these factors. Alcohol intoxication should be negatively related to perceptions of danger/concern and responsibility (Abbey et al., 2003; Davis et al., 2009; Norris et al., 1999). Because perceiving costs of intervention should require greater cognitive processing of the situation, it is likely that intoxication would be negatively related to perceived costs.

Study Aims and Hypotheses

The purpose of the current study was to investigate the extent to which alcohol intoxication impacted bystander perceptions and intentions. In particular, we were interested in the relation between intoxication and (a) perceptions of danger and concern for a potential victim, (b) perceived costs of intervening, and (c) willingness to intervene. Previous studies have explored the impact of typical drinking behavior or recalled intoxication level on bystander intentions and behaviors, but no known studies have measured bystander responses while participants were under the influence of alcohol.

We hypothesized that intoxication level would be negatively associated with perceptions of danger/concern and with perceived costs. In turn, danger/concern would be positively associated with willingness to intervene and perceived costs would be negatively associated with willingness to intervene. We predicted only a weak direct relationship between intoxication

and willingness to intervene, as we expected opposing indirect effects as mediated by perceptions of concern and costs.

Method

Participants

Participants were 106 young adults recruited from a bar or public events featuring alcohol consumption (i.e., a music festival and football games). The participants ranged in age from 17-35 (*M* = 22.34, *SD* = 3.09). Most participants (*n* = 62, 58.5%) indicated that they were currently enrolled as undergraduate students in a college or university. Other participants indicated that they already had a degree from a four-year college or university (*n* = 16, 15%) or were currently enrolled in graduate school (*n* = 14, 13%); the rest reported partial or no higher-education experience. The majority of the participants indicated their race/ethnicity as Caucasian (*n* = 86, 81.1%), followed by multi-ethnic (*n* = 7, 6.6%), African American (*n* = 6, 5.7%), Hispanic (*n* = 4, 3.8%), and Asian (*n* = 2, 1.9%).

Measures

A brief questionnaire assessed participant's demographic characteristics such as age, gender, race, and level of education received. Following questions assessed drinking behaviors such as number of drinks per week, typical level of intoxication, and levels of drinking in social settings. Participants were also assessed on previous sexual violence training and alcohol training.

Next, participants received one of two randomly-assigned scenarios. In the bar scenario, the participant imagines seeing an unknown man leading a very intoxicated female acquaintance out of a bar. It is stated that earlier the woman was observed expressing disinterest in the man. In the party scenario, the participant imagines walking into a bedroom and seeing a male acquaintance on top of an unknown girl on a bed. The participant also imagines that the girl is not into it by pushing him away and asking him to stop. The scenarios differ in a number of cues that could be relevant: whether the male or female character is known to the actor, whether the risk of sexual assault comes from physical pressure or the woman's intoxication, and the immediacy of the sexual assault risk. After reading the scenario, participants rated their agreement (using a 1-5 scale) with several statements. Participants responded to three items tapping concern for the female character (e.g., "This situation is pretty dangerous for the girl in the story"; bar α = .60, party α = .85), two items tapping perceptions of social costs (e.g., "I would worry about embarrassing myself or one of the other people if I stepped in"; bar α = .65, party α = .82), and five items tapping willingness to intervene (e.g., "I would be willing to step in and do something in this situation"; bar α = .64, party α = .73). A final question presented seven behavioral responses and asked respondents how likely they would be to choose each one (on a 1-7 scale anchored at "not at all likely" and "very likely").

Finally, participants completed a shortened (17-item) version of the Bystander Intention to Help Scale (BIHS; Banyard, 2008) to assess general willingness to intervene in potential real life scenarios in the months to come (e.g., "Making sure friends leave the party with the same people they came with"; α = .79). Participants rated on a 1-5 scale how much they agreed with each statement.

Procedure

Research assistants went to several locations near the University where it was expected that college-aged adults would be consuming alcohol. Specific locations included a local music festival, college football game, and a night life bar downtown during evening hours. Upon arriving at each location, research assistants looked for young adults and invited individuals to participate in a psychology study. Research assistants informed participants that they would not be able to consume alcohol for the duration of the study. After receiving verbal consent, participants filled out an informed consent that contained a specific statement in the middle of the paper asking the participant to write an X next to the statement. This tactic was used to ensure participants were in fact reading the consent form and would be able to read and respond to the subsequent questionnaires. If the informed consent did not have an X next to the statement, research assistants thanked the individual for offering to participate but had to inform them that they may not be able to provide sufficient responses. A total of three potential participants failed to make the required X mark after being asked to read the consent form again and were thus not allowed to participate. Participants who successfully marked an X next to the statement and provided an agreement to participate by checking an “I consent to participate” box on the informed consent paper then received a questionnaire packet. After completing the questionnaire, a hand held breath alcohol tester (Intoximeters™ FST) was used to assess the blood alcohol content of each participant. Once a participant successfully provided a BAC level, they received a five-dollar gift card to a local coffee shop or restaurant.

Results

Research Results

Mean BAC for the sample was .057 (*SD* = .06). Means and standard deviations for perceptions of danger/concern (concern), perceived costs of intervening (costs), and willingness to intervene (willingness) in the two scenarios is presented in Table 1. In both scenarios, concern for the female character was very high: people recognized that the situation was one high in risk for sexual violence. Perceived costs were fairly low, and willingness to intervene was reasonably high. No variables differed significantly between scenarios.

First, we examined correlations between BAC and each DV in each scenario. Contrary to predictions, BAC was unrelated to concern, costs, or willingness in either scenario (see Table 2). As predicted, willingness to intervene was positively related to perceptions of concern and negatively related to perceptions of costs. But because BAC was unrelated to anything, mediational analyses could not be performed.

Table 1. Means and standard deviations for party and bar scenarios

	Party Scenario (*n* = 53)	Bar Scenario (*n* = 53)
Concern	4.29 (.92)	4.57 (.54)
Costs	1.73 (1.03)	1.72 (.93)
Willingness	4.13 (.75)	4.21 (.66)

Table 2. Correlations between study variables

	BAC	Concern	Costs	Willingness
BAC	1	-.01	.06	.14
Concern	-.20	1	-.16	.46**
Costs	-.11	-.20	1	-.41**
Willingness	-.10	.51**	-.50**	1

Note: Correlation coefficients (rs) for the party scenario are presented below the diagonal. Coefficients for the bar scenario are presented above the diagonal.
** $p < .01$.

Table 3. Mean likelihood ratings for various bystander responses and correlations between responses and BAC

Party Scenario			Bar Scenario		
Response	*M*	*r*	Response	*M*	*r*
Close the door and walk away.	1.85	.40**	Tell him to leave her alone and that you will find another ride home for her.	4.55	.09
Physically pull him off of her.	3.53	.04	Check with her other friends to confirm his story.	4.12	-.03
Go look for someone else to help break them up.	3.90	.07	Let him take her home.	1.68	-.01
Walk in and ask where the bathroom is, hoping your presence makes him stop.	3.32	.24	Get a bouncer to stop him from leaving with her.	3.39	-.01
Tell him to leave her alone.	4.31	-.22	Ignore him and check on her to see if she is okay.	3.76	-.37**
Check and see if she is okay.	4.58	-.08	Ride along with them to make sure he actually takes her home.	2.59	.27
Keep watching to see what happens.	2.32	.06	Punch him or push him out of the way.	2.39	.28*

Second, we examined correlations between BAC and likelihood of engaging in various bystander responses. For the most part, BAC was unrelated to likelihood of responses, but there were some exceptions. Although “close the door and walk away” (party scenario option) was rated fairly low in likelihood, the more intoxicated participants were, the more likely they were to choose this response. In the bar scenario, BAC was negatively correlated with likelihood of checking on the female character’s well-being and positively correlated with likelihood of engaging in physical aggression against the potential perpetrator.

Third, we examined the correlation between BAC and BIHS scores and found no relationship between intoxication level and general willingness to intervene, $r(105) = .05$, $p = .63$. However, BIHS scores were significantly correlated (rs > .4, ps < .01) with concern and willingness in both scenarios.

Finally, we examined gender differences on bystander perceptions and intentions. Men and women did not significantly differ on concern, cost, or willingness in either scenario.

However, women (M = 4.32, SD = .66) did report greater willingness to intervene than did men (M = 3.94, SD = .76) on the BIHS, $t(103) = 2.75$, $p = .007$.

Experience Results

The first author, an associate professor, and the second author, an undergraduate student, were co-PIs on this study. Although the first author came up with the idea for the study and did most of the background work, the second author was influential in designing some aspects of the study. The second author helped make connections with the manager at the bar where most of the data were collected to get permission to do the study. The experience was very valuable for both authors. The first author benefited from having help manage the details of data collection, and also in learning the necessary value of being able to relinquish control! The second author benefited from taking on the responsibility of managing a field study, and from seeing how psychological science works from various angles: through working on this project, she learned about research design, research ethics, participant and data management, data analysis, data presentation, and writing.

The second author shared the responsibility of going out to field settings for data collection with several other students: most data collection shifts had three students at a time working together to recruit subjects, explain the study, distribute and collect consent forms, distribute and collect study materials, and take and record BAC readings. The students involved enjoyed the learning experience. However, they also had to manage challenges, primarily regarding collecting data from intoxicated people. One student team leader recalled a participant who repeatedly made sexist comments regarding the content of the study and tried to get the one male member of the research team to agree with him. The second author reflected on the difficulty of maintaining control of the research situation at times, given the intoxication level of participants and the noisiness of the bar environment. However, she also appreciated some of the surprises that can come from working with humans in natural environments. She noted the biggest surprise was checking the BAC level of one participant, who seemed quite functional, and learning that her BAC was well above the legal limit—indeed, it was one of the highest readings collected during the entire study. Despite a few surprises and awkward experiences, members of the research team also enjoyed how eager many young adults were to participate. They noted how many people were more motivated to learn their BAC than to get the food coupon at the end.

In sum, both authors, as well as the entire research team (as well as many of the participants) gained valuable lessons and research experience from this process.

Discussion

This study was somewhat surprising in that intoxication was largely unrelated to bystander perceptions or intentions. This may be due in part to the small sample size. Because we did not want to overburden our research participants, each participant only read one of the two scenarios. Thus, although our total sample size was 106, the effective sample size for almost all analyses was only 53. However, it is also possible that this effect is valid. Perhaps alcohol use does not have a large effect on bystander perceptions and willingness to intervene. Most of the relevant previous research has looked at the relationship between reports of typical drinking and bystander perceptions and willingness, and even this research has found significant relations only under certain conditions (Brown, 2013; Fleming & Weirsma-Mosely, 2015; Orchowski et al., 2016).

If bystander drinking does not greatly affect students' ability to notice sexual assault risk and take action against it, this is a promising state of affairs. This means bystander education

efforts can be meaningful to all students, regardless of their drinking behavior. Of course, drinkers may need specific education on how to intervene effectively, even under the influence of alcohol. Our data suggests that more intoxicated individuals may choose less-than-optimal intervention strategies.

To whatever extent that drinking impacts bystanders, educational efforts should provide tools and strategies to mitigate those effects. One promising technique was used by Dal Cin and colleagues: they provided students who had attended a training program on safe-sex behaviors with wristbands to wear as a reminder of their program participation. Program participants did not show the typical declines in safe-sex behavior when under the influence of alcohol (Dal Cin, MacDonald, Fong, Zanna, & Elton-Marshall, 2006).

The current study should be considered in light of some limitations. As previously noted, the sample size was fairly small, which resulted in low statistical power. Second, although the vignettes have been validated and used in several studies, and have been found to be believable and realistic, they may not mimic any real-life situations that participants have or could experience. Relatedly, although testing people in a natural environment should produce more ecologically-valid results than testing people in a lab (Testa et al., 2006), it is likely that the situation still felt quite unnatural, and this could have affected people's responses. In a similar vein, most of the research assistants were female, perhaps prompting participants to consider more socially-desirable response; participants might have artificially inflated their ratings of concern and willingness to intervene because of this. No measures to control for social desirability were employed.

Future research should endeavor to study the effects of alcohol on willingness to intervene in even more realistic situations. Although staging an actual sexual assault might be practically and ethically impossible, there are possible ways to increase realism. A lab-based alcohol administration study could include confederates who stage a situation involving sexual harassment to see how people respond when intoxicated compared to sober. Virtual reality techniques could also be employed to put people in a highly controlled but highly immersive environment in order to measure responses to sexual assault risk.

Although desirable, techniques involving staged emergencies or virtual reality are expensive and time-consuming. In the absence of high-impact experiments on bystander intervention in the context of alcohol and sexual violence, we can still rely on a convergence of evidence from different types of studies: our lab and other researchers have conducted studies measuring alcohol use as (a) self-reports of typical drinking, (b) recalled event-level intoxication, and (c) intoxication following drinking in a natural environment. Bystander attitudes and behavior have been measured as (a) self-reported willingness to intervene, (b) self-reports of previous bystander behavior, and (c) hypothetical perceptions and behavior in a scenario. Unfortunately, the convergence of data across studies presents an unclear picture: some studies show that men (but maybe not women) who drink more report less willingness to intervene (at least when the hypothetical perpetrator is known; Fleming & Weirsma-Mosely, 2015; Orchowski et al., 2016); others show that typical drinking is negatively related to willingness to intervene for both men and women (Brown, 2013). Some research shows that intoxication levels were higher when people intervened compared to when they did not (Brown, 2013), but we showed here that actual intoxication is mostly unrelated to hypothetical intervention. We are left with the conclusion that alcohol *might* impair willingness to intervene, but it might not. More studies will be needed to clarify the picture and to uncover the moderating factors that influence when and for whom alcohol does and does not impact bystander intervention.

The final conclusion of this study is that research involving undergraduate students is rewarding and valuable. Faculty should welcome the opportunity to involve students in research

projects. Not only does the experience provide invaluable educational opportunities for students, it can also be enlightening for faculty.

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Bystander Relationships to Victims and Perpetrators in Bystander Intervention of Sexual Violence

Emily Alleman[1], Eva Lieberman[2], and Raven Douglas[3]
[1] University of Louisiana at Lafayette, Student, eja7430@louisiana.edu
[2] University of Louisiana at Lafayette, Graduate Student, C00301746@louisiana.edu
[3] University of Louisiana at Lafayette, Graduate Student, rnd0727@louisiana.edu

ABSTRACT

The study conducted focused on bystander intervention concerning a participant's relationship to victim or perpetrator. Researchers examined participant's willingness to intervene and level of concern when given two hypothetical sexual violence risk scenarios. The study found that participants expressed concern for the female when she was described as a friend rather than a stranger. Findings also showed that participants were more willing to intervene when the female was described as a friend. Participants were less willing to intervene when the perpetrator was described as a stranger. Results suggested the importance of bystander intervention education.

Key Words: Bystander Intervention, Sexual Violence

1. INTRODUCTION

Recent studies have found major implications for bystander interventions during sexual violence. Bystanders are those present during a scenario or negative event and have the ability to help the person(s) in need (Bennett, Banyard, & Edwards, 2017). The bystander effect is a theory suggesting that the more people present in a scenario, the less likely a person is willing to intervene and help the person in need (Bennett & Banyard 2016).

Certain factors need to be addressed when examining bystander intervention. These factors include relationships to the perpetrator, relationships to the victim, and gender. In a study examining bystander intervention when presented with a sexual violence scenario, participants in the study were more likely to intervene when the victim was their friend (Bennett & Banyard 2016). This is because participants felt a responsibility to help those that were considered part of their social circle. Conversely, participants were less likely to intervene when the perpetrator was a friend. This may be because participants were less likely to associate the perpetrator's behavior as harmful when they had a relationship to them. Interestingly, researchers found that when participants considered the perpetrator as a friend, they were more likely to feel comfortable intervening in a sexual violence risk scenario. Though they felt comfortable intervening, these participants did not view the scenario as particularly harmful. Ultimately participants were most likely to intervene when both the victim and perpetrator were considered friends (Bennett & Banyard 2016).

Other studies have found that gender is a variable that should be considered when determining bystander intervention behavior (Bennett, et al., 2017). Researchers found that women were more likely to help victims while men were more likely to confront perpetrators. Regardless of whether the perpetrator was a stranger or friend, participants that were women were still more likely to help the victim than men (Bennett, et al., 2017). Furthermore, additional research has looked at situational models concerning bystander intervention. One study found that distraction, ignorance, ambiguity, failure to take responsibility, a deficit in skills, and

audience inhibition were all factors in failure to intervene in sexual assault risk scenarios (Burn, 2009). The current study examined the bystander's concern and willingness to intervene in a sexual assault scenario when participants' roles as the bystander were manipulated with relationships to the victim or perpetrator.

2. METHODS

2.1 PARTICIPANTS

The current study uses data that was collected previously as part of a larger study. Participants were 288 undergraduate students. 177 females (61.4%) participated in the study while 111 males (38.6%) participated in the study. The mean age of participants was 19.67 (SD 1.9). The majority of the undergraduates sampled were Caucasian (n=212, 73.61%) while 60 participants (20.83%) identified as African American. The remaining 16 participants (5.56%) identified as other minorities.

2.2 PROCEDURES

Participants were give two hypothetical scenarios to read. The first scenario described a bar scene where participants were told to imagine a female dancing with a male who was making unwanted sexual advances towards her. The female left the dance floor and then later in the night was approached by the same male. The female displayed non-verbal cues to show that she was not interested. At the end of the night, participants observed the female, visibly drunk, leaving with the same male. The second scenario described a scene at a party. Participants were told to imagine they had accidentally walked into a room where unwanted sexual advancements were made on a drunken female. Participants were told a male was on top of the female ignoring her protests to stop the sexual advances.

Participants read both the bar and party scenario. The scenarios differed regarding participants' relationship to the victim and perpetrator. For both the party and bar scenarios, half of the participants read one scenario in which the male was a friend and the female was a stranger, while the other half read a scenario in which the female was a friend and the male was a stranger. After reading the bar and party scenarios, participants then completed a questionnaire assessing their concern for the female and their willingness to intervene.

2.3 MEASURES

Surveys were scored using a 5-point Likert Scale to measure participants' concern and willingness to intervene. The scale ranged from 1 (strongly disagree) to 5 (strongly agree).

One-way analyses were run to measure participants concern for the victim in the bar scenario and again for the victim in the party scenario. A one-way analysis was run to measure participants willingness to intervene in the bar scenario and again in the party scenario. In all analyses, the independent variable was the relationship (friend vs. stranger) to the victim and perpetrator.

3. RESULTS

Concern for the female in the bar scenario differed based on social relationships: People reported more concern for the female when she was described as a friend (and the perpetrator

was a stranger; $M = 4.685, SD = .506$) than when she was described as a stranger (and the perpetrator was a friend; $M = 4.338, SD = .844$), $t(236) = -4.238, p < .001$.

Willingness to intervene in the bar scenario differed based on social relationships: People reported more willingness to intervene when the female was a friend (and the perpetrator was a stranger; $M = 4.18, SD = .70$) than when the perpetrator was a friend (and the female was a stranger; $M = 3.94, SD = .89), t(271) = -2.56, p < .006$.

Concern for the female in the party scenario did not differ; $t(278) = 0.47$.

Willingness to intervene in the party scenario did not differ; $t(282) = 1.78$.

4. DISCUSSION

It is important to note that the social relationship to the victim and perpetrator mattered only in the bar scenario and not the party scenario. One reason for this finding may be because of ambiguity. In the bar scenario, there was a more ambiguous risk of sexual assault meaning that participants had more room to interpret the victim's level of risk. This differs from the party scenario in which the risk of sexual assault is clear; there is an assault taking place which the bystander has accidentally walked into. It is important to note that both the bar and party scenarios displayed similar patterns of results overall. Means for concern and willingness to intervene were high no matter the scenario. Meaning that while the social relationship was not significant in the party scenario, participants still expressed concern for the victim and a willingness to intervene.

Findings were similar to Bennett et al., (2017) in that bystanders were more likely to intervene when the victim was female; yet bystanders were less likely to help a victim when the perpetrator was considered a friend. Because participants were less likely to intervene in the bar scenario when the perpetrator was considered a friend, this suggest that future research should focus on teaching methods to confront sexual aggressive behavior of friends.

Results from Burn (2009) supported the need for proper bystander intervention education. Participants' unwillingness to intervene suggests a lack of skills needed to intervene in risky scenarios. Burn (2009) suggests the importance of teaching the bystander intervention model for bystanders to be aware of the barriers they face in recognizing and taking action when sexual assault occurs. Future research is needed to determine the best way to teach bystander intervention skills.

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Autism Knowledge Compared to General Knowledge amongst College Students

Sydney Andrews [1], Savannah D'Aubin[2] and Valanne MacGyvers[3]
[1]Department of Psychology, University of Louisiana at Lafayette, sma7807@louisiana.edu
[2]Department of Psychology, University of Louisiana at Lafayette, sld0392@louisiana.edu
[3]Department of Psychology, University of Louisiana at Lafayette, vxm2873@louisiana.edu

ABSTRACT

Since the early part of the twenty-first century, autism organizations have had a mission to increase awareness of autism symptomology and to reduce the stigma attached to the disorder (Autism Speaks, 2017). In this study, we compared students' knowledge about autism spectrum disorders (ASD) to their general knowledge of things. We compared their knowledge of ASD to a scale of empathy. We found that knowledge of ASD was about the same as general knowledge. As expected, familiarity did improve ASD knowledge, but being related to a person with ASD did not improve knowledge. That finding was counterintuitive. The empathy measure showed us that those who scored higher on the measure of empathy showed greater ASD knowledge.

Key Words: Autism Knowledge, Familiarity, Empathy

1. INTRODUCTION

In 2005, Autism Speaks was founded. Within a few years, it had joined with the Autism Coalition for Research and Education (ACRE), the National Alliance for Autism Research (NAAR) and the Cure Autism Now (CAN) to form a single organization dedicated to research, to meeting the needs of autistic individuals and to increasing the acceptance of autism spectrum disorders (Autism Speaks, 2017). This and similar organizations have worked to change the public awareness of autism. At the same time, the incidence of autism has increased from 1 in 2700 children in 1989 to 1 in 68 children today (CDC.gov, 2009). So, while autism had been considered a relatively obscure diagnosis, it has become almost common today. This raises the question as to whether average people are sufficiently knowledgeable about the disorder.

2. METHOD

Undergraduate researchers at UL Lafayette developed a measure of Autism Knowledge consisting of 40 true/false items about autism. There were three items about personal familiarity with ASD; had the participant heard of ASD before, met someone with ASD and had a family Member with ASD. Also included were ten true/false items about general knowledge, for the purposes of comparison. This measure was combined with the Interpersonal Reactivity Index (IRI) (Davis, 1980), and has been administered via Survey Monkey to 323 undergraduates (Males = 83, Females = 240) in the University of Louisiana at Lafayette's Psychology Department subject pool (Note we continue to collect data from males to better balance the sample). The study received approval from the University's ethical review board and all participants voluntarily gave informed consent.

3. RESULTS

The sample scored an average of 75.1% correct on the ASD knowledge items and 74.4% correct on the general knowledge items. There was no significant difference between these scores. Analyses indicated a gender effect (t = 2.07, p = 0.04), such that women (M = 30.31) had greater knowledge of ASD than did men (M = 29.27).

We found that 88.3% of the sample had heard of ASD before, that 80.6% met a person with ASD and that 25.8% of the participants had a family member with ASD. Participants who had heard of ASD before, demonstrated greater knowledge of ASD $F(1, 323) = 15.55$, $p < .01$ (Familiar M = 30.28, sd = 3.87; Unfamiliar M = 28.61; sd =4.38). Participants who had met someone on the spectrum demonstrated greater knowledge of ASD $F(1, 323) = 6.04$, $p < .05$ (Met M = 30.50, sd = 3.71; Not Met M = 28.35; sd =4.53). However, having a family member with ASD did not affect one's knowledge of ASD, $F(1, 323) = 0.25$, *ns.* Post hoc analysis indicated there were no gender differences in any of the three familiarity indices.

The IRI (Davis, 1980) yields four subscales, Empathic Concern, Perspective Taking, Personal Distress, and Fantasy (a measure of empathic concern for fictional characters). Initial analysis revealed that Empathic Concern, Fantasy, and Personal Distress all were positively related to ASD Knowledge. Further exploration, using a step-wise regression analysis revealed that only the Empathic concern scale retained significant prediction of ASD Knowledge, such that individuals with higher scores on the Empathic Concern subscale (n = 274) of the IRI demonstrated more ASD knowledge (F (1,269) = 13.34, R^2 = 0.08, p< 0.001).

4. DISCUSSION

It is clear that knowledge about autism has dramatically increased in the past 17 years. This research also shows that contact with people on the spectrum can increase knowledge; however, being related to a person with ASD did not afford greater knowledge. This difference in results may indicate that many people have experience with individuals diagnosed with an ASD as a consequence of the increased frequency of the disorder. It may no longer be necessary to have it in the family if it is everywhere in the neighborhood.

It is not surprising that women know more about ASD than men, as women are more likely to be concerned with childhood disorders than are men, and in this sample, had greater empathic concern.

People who are high in empathic concern have been shown to be more attuned to the needs of others. This may mean that they are more likely to seek out information to better understand people. That would then result in the greater ASD knowledge found in this study. Clearly empathic concern is an important variable among those who might be caring for individuals with autism.

These results seem to suggest that advocacy groups should shift away from public information and spend more of their dollars on research as to the causes and treatment of ASD.

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Empathy-Related Responding to Social Others' Distress in Preschool Years

Nicholas Barker[1] and Nektar Ege Altintopark[2]
[1]University of Louisiana at Lafayette, neb3148@louisiana.edu
[2]University of Louisiana at Lafayette, c00274482@louisiana.edu

Hung-Chu Lin[3]
Psychology Department, Supervising Faculty
[3]University of Louisiana at Lafayette, hung-chu.lin@louisiana.edu

ABSTRACT

This study examined preschoolers' responses to social others' distress by manipulating the factor of familiarity with social partners. Multiple aspects of children's responding to distress exhibited by caregiver, an adult stranger, and an infant, including empathic concern, personal distress, helping action, and disengagement were documented. The findings indicated that, although egoistic distress and disengagement were evident in preschoolers' response to social others' distress, children nevertheless exhibited behaviors organized around the well-being of social partners. Notably, young children's other-oriented behaviors were positively related to personal distress; their personal distress negatively related to disengagement. Children's differential responses revealed the effect of familiarity with social partners, supporting the notion of situational ambiguity affecting the tendency to exhibit prosocial helping.

Key Words: Empathy, Personal Distress, Cognitive Inquiry, Prosocial Helping

1. INTRODUCTION

Children become increasingly competent in showing other-oriented empathic responses to social others' distress in the second year of life (Hoffman, 1975); self-focused distress responses, however, remain evident, particularly when distress stimuli are highly intense (Roth-Hanania, Davidov, & Zahn-Waxler, 2011). Personal distress has been described as a qualitatively distinct element from empathic concern in the process of responding to another's plight (Davis, 1983). In contrast to empathic concern, which involves affective responses organized around the well-being of the observed person (e.g., sympathy, compassion, tenderness, etc.), personal distress involves heightened arousal and negative emotions (e.g., alarm, aversion, helplessness, etc.) centering on the welfares of the self.

Developmentally, reflexive or contagious crying in response to other infants' crying in the first year of life has been postulated as a primitive antecedent of empathic arousal, in which distress is experienced with no clear differentiation between the self and other (Sagi & Hoffman, 1976). With cognitive advancement in the understanding of the self/other distinction, toddlers become better capable of processing others' experiences with clear ownership of affect, thus, more sophisticated in modulating distress arousal into a mature form of empathic concern for others. Hence, personal distress may well be an important foundation upon which empathy emerges during toddlerhood (Hoffman, 1975; Zahn-Waxler & Radke-Yarrow, 1990). For this reason, simply assuming the two processes as functionally orthogonal and opposing to each other may unduly limit our understanding of their connections and quickly dismiss an integrative

view, which is potentially important to inform possible regulatory mechanisms underlying empathic responding. Moreover, both processes involve affective arousal in response to others' distress thus may reflect one's general patterns of response propensity in similar ways (Batson, Fultz, & Schoenrade, 1987; Zahn-Waxler & Radke-Yarrow, 1990). The questions arise as to whether young children exhibit behaviors reflecting the paradoxical existence of empathic concern and personal distress when responding to social others' distress and whether the two qualitatively distinct processes are merely inversely related to each other. The information addressing this issue is limited beyond toddlerhood. Understanding how children organize distinct elements in empathic responding is essential to support and foster regulatory processes that may motivate prosocial functions. The purpose of this study was to examine preschoolers' differentially responses to different social partners. Moreover, the present study examined the relations between different aspects of responding to social others' distress, including affective and cognitive processes as well as prosocial helping.

2. METHOD

2.1. Participants and Experiment Setting

Preschoolers (38 boys, 23 girls, mean age = 44 months, *SD* = .94) and their caregivers were recruited from local preschools and also from University students who were parents or regular caregivers of preschoolers. Due to incomplete data, two males were excluded from the subsequent analyses. The experiment was conducted in a 2.4 m x 4.0 m room equipped with two digital video cameras and an omni-directional microphone mounted on the walls. The experimental room was equipped like a nursery with children's books and toys on top of a table, chairs for preschoolers, a rocking chair, a chair for the caregiver, a bassinet, and an infant bottle in the bassinet. The video recording was operated in a separate control room with a split-screen monitor allowing viewing of the child and the adult at the same time. Trained operators manipulated cameras to focus on faces of the child and the adult at all times.

2.2. Procedure and Conditions

All children went through three conditions of simulated distress by different social partners in the same order, beginning with their familiar social partner (either parent or caregiver), followed by an adult stranger, and a life-like infant manikin. The caregiver stayed with the child throughout the experiment (across the three conditions) while completing the demographic information sheet and the two questionnaires.

Upon arrival, an experimenter escorted the caregiver and the child to the experimental room. After child assent was procured, the caregiver was given a script so that the caregiver knew exactly how to simulate the distress. The experimenter then left the room.

A few minutes after the experimenter left the room, the caregiver began simulating the distress by feigning that his/her index finger was snapped by the spring clip of the clipboard. The caregiver simulated the distress by showing painful expressions in the face and saying "ouch" several times.

The Stranger condition began when a female experimenter (the confederate), whom the child never met before, came in with a life-like infant manikin wrapped in her arms. The stranger began building a rapport with the caregiver and the child, acting like she was the baby's mother. After a few minutes, the stranger began simulating a sudden onset of gastrointestinal distress with painful expressions in her face while verbalizing about the

discomfort. The child's responses were observed for as long as the child was responding to the confederate.

About 15 seconds after the confederate left, an infant cry stimulus was played through the wireless speaker hidden beneath the bassinet mattress pad. The child's responses were observed for at least 30 seconds. The crying sound continued for another 15 seconds until the confederate came in and picked up the infant manikin, ending the condition. If the child displayed too high levels of distress (e.g., crying) in respond to the simulated infant crying, the condition ended instantly to prevent the child from experiencing more distress.

2.3. Behavioral Coding

Preschoolers' responses towards social others' distress (in the Caregiver, the Stranger, and the Infant conditions) were coded into three behavioral categories, including (1) other-oriented behaviors, (2) personal distress, and (3) disengagement. Other-oriented behaviors were defined as any behaviors that suggested a focus on the well-being and benefits of another person. The category of other-oriented behaviors included four sub-categories of responses: (1) concerned expression, (2) cognitive inquiry/reasoning, (3) approaching the distressed, and (4) helping actions. Concerned expression was a facial expression that shows obvious concern for the victim (e.g., looking at the distressed with concern). Cognitive inquiry referred to any action taken by the child (verbally or visually) when investigating, reasoning, or assessing the situation of a distressed person (e.g., visually searching for cause and effect of the distress situation, asking when the distress will end, describing how the distressed feels). Approaching the distressed referred to locomotive movement that reduced the physical distance between the child and the distressed. A helping action referred to behavior that offered comfort to the distressed or assists in alleviating the distress of another person (e.g., patting the distressed gently, giving objects to the distressed in order to give comfort, verbally offering solutions).

Behaviors indicating personal distress were those that indicated self-focused affective or physical processes as a result of witnessing another's distress (e.g., crying, restlessness, covering ears, and asking to leave). Disengagement referred to any acts that indicated the child's aversion to the distress of another person or reluctance to engage with the person in distress (e.g., ignoring or looking away from the distressed, irrelevant speech, moving away from the distressed).

Two undergraduate students (one primary coder, the other reliability coder) were trained to code using the Observer XT 14.0. The reliability coder coded randomly selected 15% of all the videos for the purpose of inter-observer reliability. The mean inter-observer reliability kappa value was .95.

3. RESULTS

3.1. The Three Behavioral Categories

There was a main effect of social partner on preschoolers' responses to social other's distress, $F(2, 57) = 6.19$, $p < .0001$. Simple comparisons indicated that there was a significant difference between time spent in other-oriented behavior ($M = 41.49$, $SD = 15.63$) and that in personal distress ($M = 11.26$, $SD = 10.95$), $t(58) = 15.33$, $p < .0001$. There was also a significant difference between durations of personal distress and disengagement behavior ($M = 41.13$, $SD = 11.57$), $t(58) = -7.77$, $p <.0001$. Across conditions, females spent more time in other-oriented behaviors ($M = 45.95$, $SD = 17.56$) than males ($M = 35.11$, $SD = 23.68$), $t(58) =$

1.93, p = .03. In contrast, females spend less time in disengagement behaviors (M = 35.11, SD = 23.68) than males (M = 45.87, SD = 20.70), $t(58) = -1.83$, p = .03. Females and males did not differ in the time spent in personal distress.

3.2. Four Types of Other-oriented Behaviors

Within the category of other-oriented behaviors, preschoolers spent the greatest amount of time in concerned expression (M = 25.47, SD = 13.22), followed by cognitive inquiry (M = 16.07, SD = 0.12), helping action (M = 6.38, SD = 5.22), and approaching the distressed (M = 2.66, SD = 1.82), respectively. All the four subcategories of other-oriented behaviors were significantly different from each other at the p level smaller than .0001.

3.3 The Effects of Familiarity with Social Partners

One-way repeated measures ANOVA was used to examine the effects of familiarity with social partners on preschoolers' other-oriented behavior. The overall F test showed that there was a significant main effect of the familiarity with social partners on other-oriented behavior, $F(2, 57) = 3.68$, p = .0300. Simple comparisons revealed that preschoolers spent significantly more time in other-oriented behavior in the Caregiver condition (M = 46.51, SD = 23.78) compared to the Infant condition (M = 39.14, SD = 19.83) and Adult Stranger condition (M = 37.81, SD = 21.23), $t(58) = 2.42$, p = .0200, and $t(58) = 2.39$, p = .0200, respectively. However, there was no significant difference in the durations of other-oriented behavior between the Adult Stranger and Infant conditions.

There was no main effect of the familiarity with social partners on personal distress, but there was a significant main effect of the familiarity with social partners on disengagement behavior, $F(2, 57) = 9.87$, p = .0002. Simple comparisons indicated that that preschoolers spent the least amount of time in disengagement with the caregiver (M = 37.01, SD = 27.11), compared to when they were with the adult stranger (M = 50.14, SD = 29.40) or infant (M = 43.44, SD = 31.38), $t(58) = 4.40$, $p < .0001$, and $t(58) = 3.05$, p = .00, respectively.

3.4 Relations between the Three Behavioral Categories

Bivariate analysis was conducted to examine the relations between other-oriented behaviors, behaviors indicating personal distress, and disengagement behaviors across conditions. As might be expected, other-oriented behavior and disengagement were negatively correlated, r = -.72, $p < .0001$. Notably, however, behaviors reflecting distress emotions that have an egoistic focus (personal distress) were not only positively correlated with other-oriented behavior, r = .41, p = .0013, behaviors indicating personal distress were negatively related to disengagement, r = -.45, p = .0003.

3.5 Relations between the Four Subcategories of Other-Oriented Behavior

Across conditions, the time preschoolers spent in concerned expression was positively related to that in cognitive inquiry, r = .32, p = .0106. Time spent in approaching the distressed was significantly related to time spent in helping actions, r = .27, p = .0333.

4. DISCUSSION

The findings indicated that, although egoistic distress and disengagement were evident in preschoolers' response to social others' distress, they nevertheless exhibited behaviors organized around the well-being of social partners. In fact, the proportion of time spent in other-oriented behaviors across different social partners was more than five times than the time spent in behaviors indicating personal distress. Children at preschool age clearly demonstrated proficiency in moving beyond reaction that was contagious and self-focused in nature and investing in response that was altruistic and prosocial, revealing regulatory competence in an empathy arousing context.

It was noteworthy that the amount of time spent in behaviors suggestive of personal distress was positively related to that spent in other-oriented behaviors. At a first glance, the positive relation between behaviors reflecting self-focused goals and those reflecting other-focused concerns appeared counterintuitive. However, it was likely that conducting comforting and helping actions might have served as one of the ways for preschoolers to reduce their distress arousal upon witnessing others' distress because helping often leads to positive affect and feeling good about the self (Hoffman, 1975; Zahn-Waxler, Friedman, & Cummings, 1983).

One possible explanation for the inverse relation between personal distress and disengagement involves viewing self-focused arousal as an antecedent process that forms a basis for one to engage or disengage when seeing someone in need. In a similar manner, in which personal arousal potentially propels one to experience empathic concern, and in turn, conduct prosocial action, certain levels of distress arousal is needed for one to become engaged in an empathy arousing situation. Put another way, disengagement could have been a projection of uninfluenced arousal even witnessing clear signs of distress in social partners—one of the possible characteristics of emotional indifference and callousness.

Children displayed more other-oriented behaviors and less disengagement when responding to distress in their caregivers as compared to when responding to distress in their strangers (both adult and infant). The finding supported the notion of situational ambiguity (Burger, Soroka, Gonzago, Murphy, & Somervell, 2001) in that children's willingness to help others in distress was hindered if they were involved in unfamiliar situations. The presence of unfamiliar people (both the adult stranger and the infant) could have made the situation ambiguous and uncertain, preventing preschoolers from feeling comfortable for social engagement.

This study extended prior research on young children's prosocial behavior by documenting how different aspects of preschoolers' empathy-related responding related to one another across different social contexts. Instead of focusing merely actions that are perceived to be prosocial and with positive qualities, the current study documented behaviors suggestive of egoistic concern and disengagement.

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The Effect of Dimethyl Sulfoxide (DMSO) on Tentacle Regeneration in *Nematostella vectensis*

Kymber Bly[1], Ada Tusa[2], and Patricia Mire[3]

1. Department of Biology, The University of Louisiana at Lafayette, klf3189@louisiana.edu
2. Department of Biology, The University of Louisiana at Lafayette, aft1999@louisiana.edu
3. Department of Biology, The University of Louisiana at Lafayette, pmire@louisiana.edu

ABSTRACT

Nematostella vectensis is a model sea anemone used for genetic, developmental, and physiological studies (Putnam, et al., 2007). These anemones possess hair bundles on tentacles resembling mechanoreceptors housed in the vertebrate ear (Watson, Mire, and Kinler 2009). The anemones use these hair bundles to detect vibrations of nearby prey and regulate effector cells which aid in prey capture. Previous studies treating anemones with an inhibitor of the Delta-Notch signaling pathway resulted in an increase in hair bundles (Zeringue, et al., 2017) and a decrease in tentacle regeneration (Puckett and Tusa, 2017). In those studies, cells were made permeable to the inhibitor by including 0.1% DMSO (dimethyl sulfoxide) in the solution. Further preliminary studies suggest that DMSO has an unexpected stimulatory effect on tentacle regeneration when compared to seawater controls. In the present study, tentacle regeneration was further monitored after a 48 hour exposure to DMSO concentrations of 0.2%, 0.4%, and 0.8% in order to determine the optimal dose for increased rate of regeneration. Results indicate that the 0.2% DMSO experimental group showed the fastest rate of regeneration over 18 days when compared to the other concentrations of DMSO as well as to seawater controls. Moreover, a significant, long-lasting effect (over a 52-day period) on tentacle regeneration was found with 0.2% and 0.4% DMSO treatments. This work suggests that regeneration of tentacles is normally regulated by a pathway sensitive to either DMSO specifically, or to membrane permeability in general. In either case, since DMSO is often used to enhance transport of chemicals into cells, our results underscore the importance of testing the effects of DMSO alone on biological phenomena.

1. INTRODUCTION

Sea anemones are the simplest animals possessing a nervous system. The sea anemone, *Nematostella vectensis,* has arisen as a model organism for biological studies because its genome has been fully sequenced and is easy to rear in the laboratory (Putnam, et al., 2007). Differentiation of specialized cells in *Nematostella vectensis* is regulated by the Delta-Notch signaling pathway. An inhibitor used to study the activity of this pathway is DAPT (N-[N-(3,5-difluorophenacetyl)-1-alanyl]-S-phenylglycine t-butyl ester). Transport of DAPT into cells requires the aid of a solvent such as DMSO, which is used to increase permeability of cell membranes, therefore allowing the transport of polar molecules such as DAPT into the cells.

Our interest in DMSO as an experimental treatment arose from previous studies on sea anemones which used a 0.1% DMSO solution as the negative control. Preliminary findings from this study suggested an increased rate of tentacle regeneration and overall enhancement of final tentacle length when compared to 0.0% DMSO seawater controls (unpublished observation). Other studies on multiple myeloma cells have shown increased

cell growth rates when exposed to solutions of 0.2% DMSO (Wen, et al., 2015). Based on these findings, it was hypothesized that increasing DMSO concentration would further enhance the regeneration rate and ultimate lengths of regenerated tentacles.

2. METHODS

A dose response assay was conducted to observe the effect of varying DMSO concentrations on tentacle regeneration. Nine animals were deprived of food for 72 hours before being isolated into individual petri dishes. These anemones were treated with an anesthetizing solution, 50 mM potassium chloride (KCl) solution, for one hour and then imaged to record the pre-cut tentacle lengths. Next, all tentacles on each animal were excised. Images were taken after this removal of tentacles, as well, to record post-cut tentacle lengths. Groups of three were placed into 16 ppt (parts per thousand) seawater alone (controls) or seawater containing DMSO at concentrations of 0.2%, 0.4%, and 0.8% for 48 hours, and then placed into fresh 16 ppt seawater. Images were taken of each animal daily to monitor regeneration. All tentacle measurements consisted of an average of three tentacles per animal. Measurements were taken using ImageJ software, and the lengths were averaged and plotted against time in order to determine the rate of regeneration.

3. RESULTS

Average tentacle lengths at the three concentrations of DMSO and seawater controls were plotted over time and each data set was fit to a linear trendline characterized by a slope equation and R^2 value as shown (Figure 1).

In each of the three DMSO treatments, rates of regeneration fit well to a linear function, with R^2 values all greater than 0.9353. However, regeneration of seawater controls did not fit well to a linear function ($R^2 = 0.7311$). Furthermore, tentacle lengths at Day 11 were significantly increased compared to day 18 for 0.2% DMSO but not for seawater controls (Student's t-test $p=0.45$ and $p=0.75$, respectively).

The animals exposed to a 0.2% DMSO solution experienced the highest rate of regrowth over 18 days (slope=0.5371) followed by 0.8% (slope=0.4826), 0.0% DMSO (slope=0.4203) and 0.4% (slope=0.399).

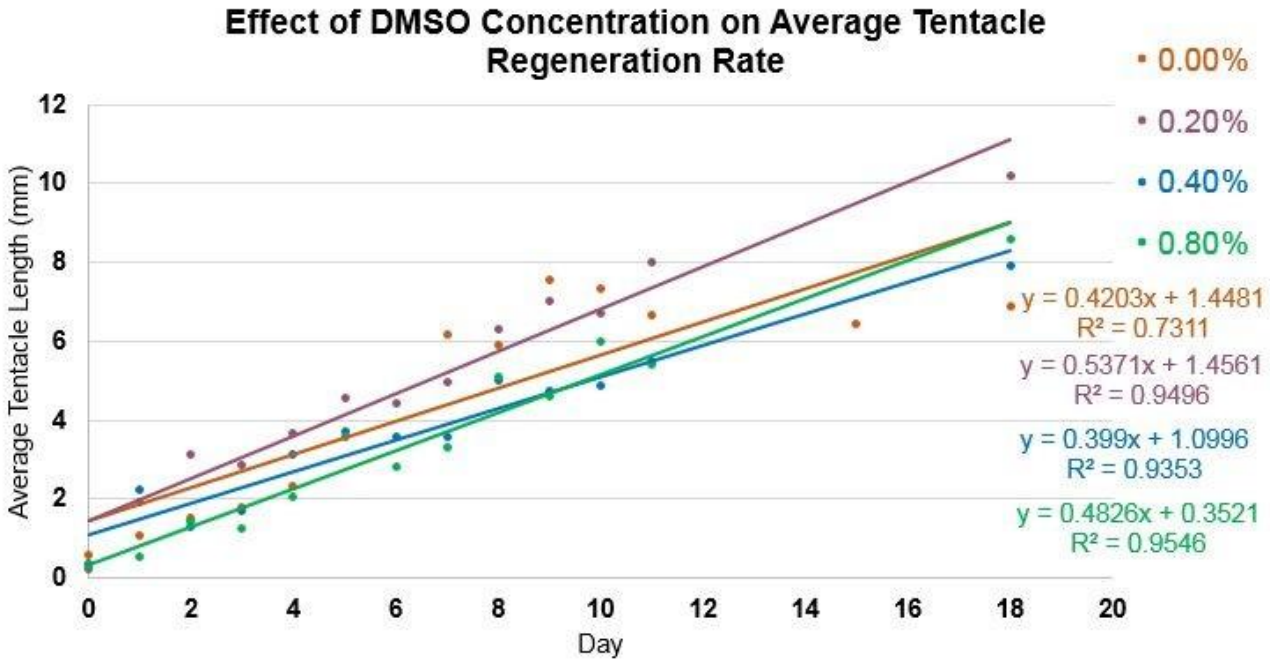


Figure 1. Average Tentacle Regeneration Rate for seawater controls and for 0.2%, 0.4% and 0.8% DMSO treatments over 18 days.

T-tests conducted on the seawater controls showed that there was no significant difference in tentacle lengths prior to cutting (Pre-cut) and lengths at Day 11 (p=0.5166) nor between Pre-cut and Day 18 (p=0.4521) (Table 1). For comparison, the experiments utilizing 0.1% DMSO as a negative control showed a significant difference (p=0.017) between Pre-cut and Day 11 (data not shown). There was a significant difference in tentacle length between the seawater anemones and the 0.2% DMSO group at Day 11 (p=0.0499) (Table 1).

Table 1. T-Test results for seawater control comparisons between Pre-cut lengths and lengths at Days 11 and 18, and compared to 0.2% DMSO at Day 11.

Comparison	**P Value**
Seawater controls, Precut & Day 11	0.5166
Seawater controls, Precut & Day 18	0.4521
Seawater controls Day 11 & 0.2% DMSO Day 11	0.0499

For each of the DMSO groups, Pre-cut tentacle lengths were compared to Day 11 and Day 18 lengths. After 11 days, only the 0.2% showed a significant difference in length

(p= 0.034) (Table 2). After 18 days, as well, only the 0.2% yielded a significant difference (p=0.013) (Table 3). P values obtained from these tests are displayed (Table 2 and Table 3).

Table 2. T-Test results for 0.2%, 0.4%, and 0.8% DMSO treatment comparisons between Pre-cut lengths and lengths at Day 11.

Pre-cut versus Day 11	**P Value**
0.2%	0.034
0.4%	0.397
0.8%	0.421

Table 3. T-Test results for 0.2%, 0.4%, and 0.8% DMSO treatment comparisons between Pre-cut lengths and lengths at Day 18.

Pre-cut versus Day 18	**P Value**
0.2%	0.013
0.4%	0.056
0.8%	0.066

Since the trendline analysis (Figure 1) suggested that DMSO treated anemones continued to experience linear growth rate throughout the 18 day period in contrast to the seawater controls, the DMSO treatments were monitored through Day 52. Significant increases in tentacle lengths were found when comparing Day 18 to Day 52 for 0.2% and 0.4% DMSO but not for 0.8% (Table 4). The trendlines projected through Day 52 do not follow a linear growth rate (Figure 2).

Table 4. T-Test results between Day 18 and 52 for 0.2%, 0.4%, and 0.8% DMSO.

DMSO Concentration	**P Value**
0.2%	0.01815
0.4%	0.01232
0.8%	0.11238

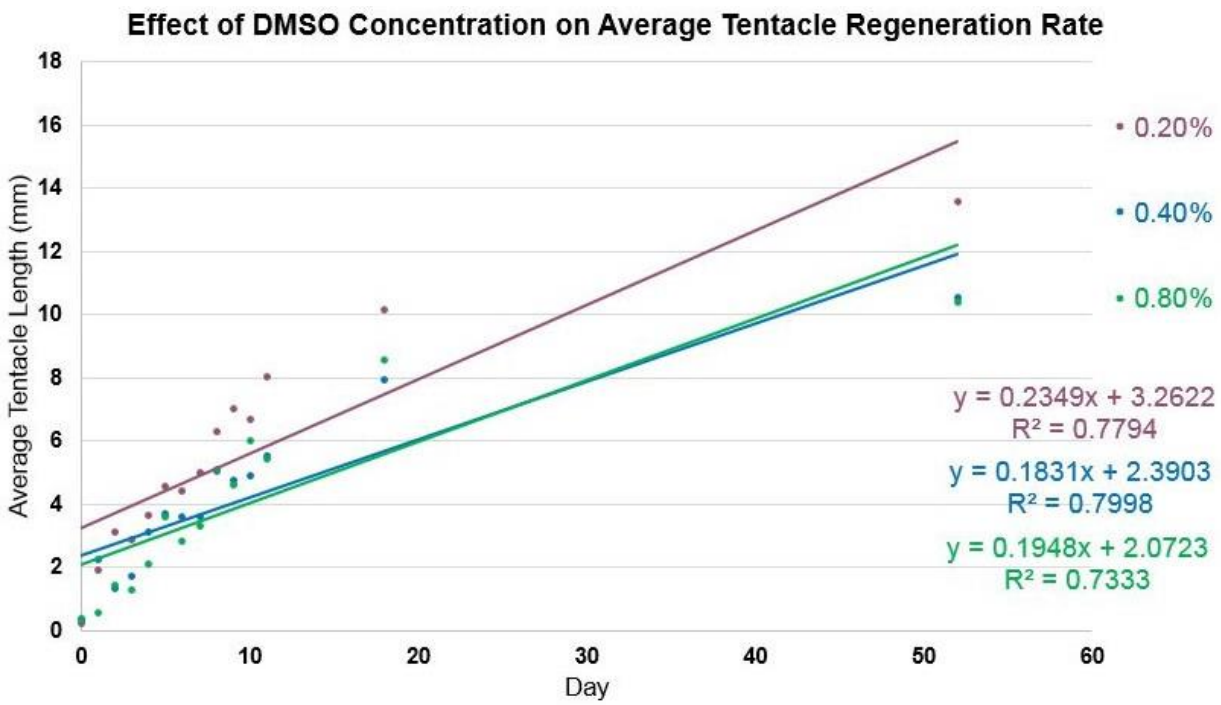


Figure 2. Average Tentacle Regeneration Rate for 0.2%, 0.4% and 0.8% DMSO treatments over 52 days.

Animals treated with 0.2% DMSO showed a notable increase in tentacle length upon regeneration. On average, tentacles prior to cutting measured 4.396 mm (Figure 3a). By Day 52, tentacles surpassed this initial average length with an average of 13.569 mm (Figure 2). A tentacle measuring 18.209 mm on Day 52 is shown (Figure 3b). Figures 4a-5c show a comparison of regeneration between the seawater and 0.2% DMSO groups over 14 days.

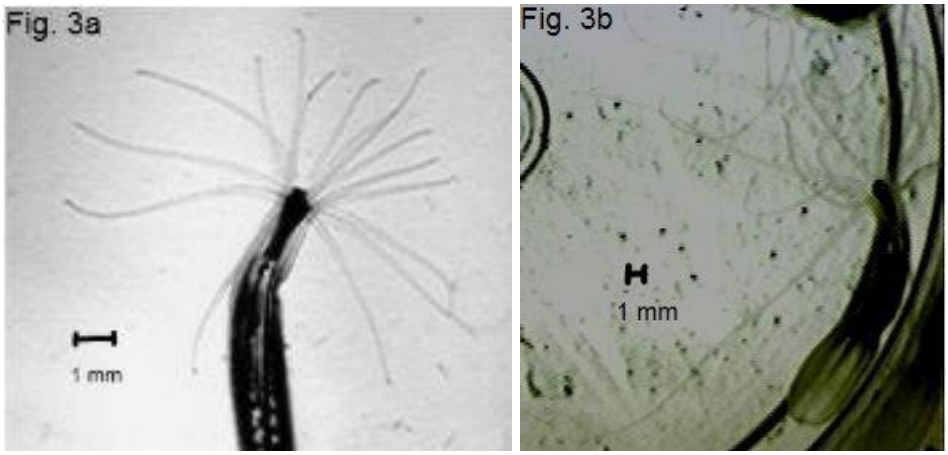
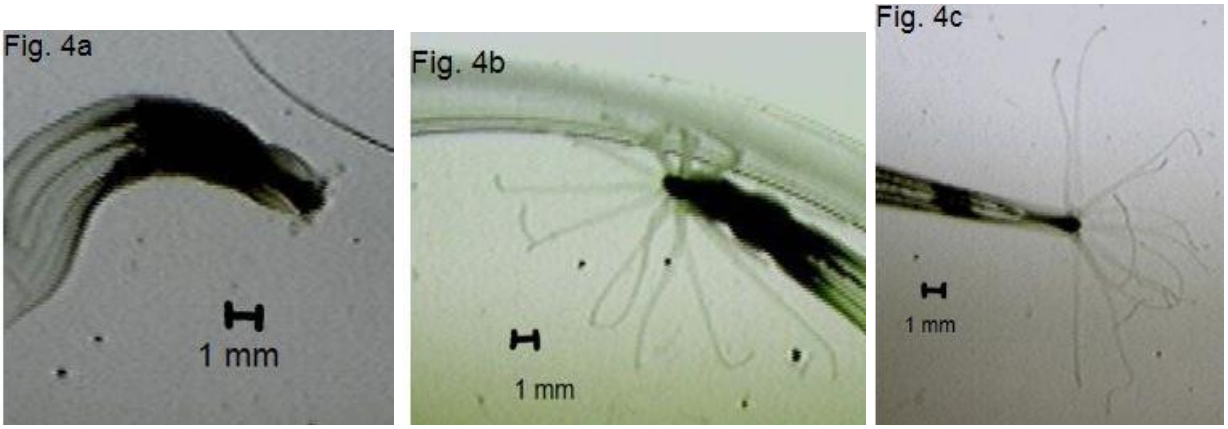
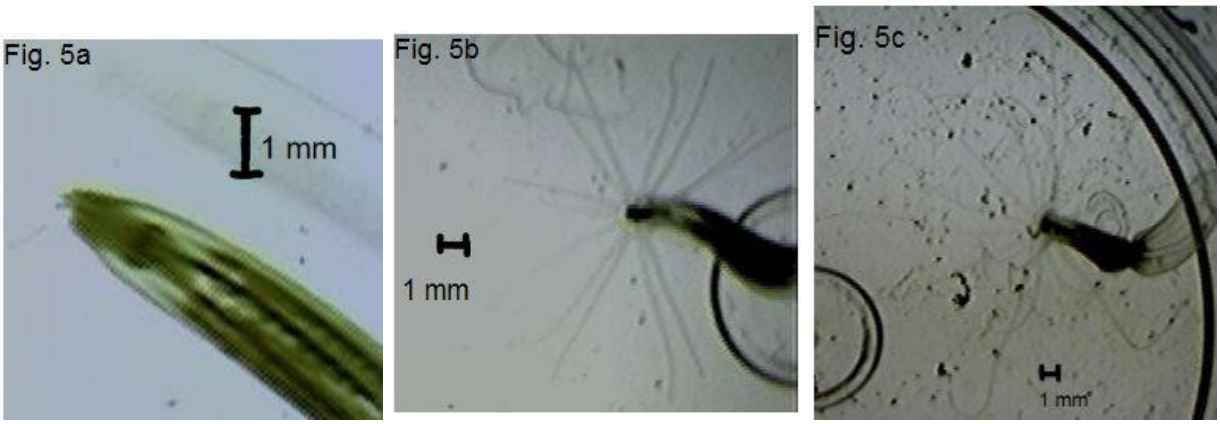


Figure 3a. Pre-cut tentacles representing average initial length.
Figure 3b. Anemone treated with 0.2% DMSO experienced enhanced regeneration.



Figures 4a, 4b, 4c. Pre-cut, Day 7, Day 14 of seawater controls.



Figures 5a, 5b, 5c. Pre-cut, Day 7, Day 14 of 0.2% of DMSO.

4. DISCUSSION

The slopes obtained from linear trendlines in the dose response assay suggest that a 0.2% concentration of DMSO provided the highest rate of tentacle regeneration (Figure 1). Also, when the animals were imaged and measured 52 days after cutting, a statistically significant increase in length was observed for the 0.2% and 0.4% DMSO-treated anemones, as shown in Table 3. The tentacle regeneration of 0.2% and 0.4% DMSO anemones remained linear throughout Day 52 thus indicating that the DMSO had a long lasting effect on tentacle regeneration.

The importance of this study lies in the observance of an unexpected effect on tentacle regeneration by DMSO which begs the consideration of the potential antagonistic relationship between DAPT and DMSO. The previous studies utilizing DAPT may have observed more of an inhibitory effect in regeneration rates if the DMSO were not present. This implies the importance of seawater controls containing no DMSO.

Potential pathways of DMSO action include an indirect and direct method. The DMSO may have an indirect effect by altering membrane permeability, thus changing the electrochemical gradient of ions in the cells. Alternatively, the molecule itself may alter gene expression, leading to cell proliferation.

4.1 ONGOING STUDIES

Now that this optimal concentration of DMSO solution is established, 0.2% DMSO treatments are being conducted while varying incubation time to determine the minimum time required to affect tentacle regeneration rates.

Future experiments will investigate the mechanism of action for DMSO.

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Sprayable Foam and Gel Based Biomaterials for Soft Tissue Injury

Saad R. Bux[a], Vanel Porter[a], Melanie Sanders[a], Elizabeth Owuor[b]*, Dilip Depan[a]*
[a]Chemical Engineering Department, University of Louisiana at Lafayette.
[b]Chemistry Department, University of Louisiana at Lafayette.
*eao0903@louisiana.edu, ddepan@louisiana.edu

ABSTRACT

Traumatic injury (TI) is a life-threatening prospect for soldiers in combat as well as for civilians in serious accidents, such as motor vehicle accidents. Uncontrolled hemorrhage, i.e. excessive loss of blood, due to injury is a leading cause of death in both soldiers and civilians who experience TI. One common way of controlling hemorrhage is by applying pressure to the wound site. However, this approach is typically not suitable for use in soft-tissue TI. For example, organs such as the eyes, lungs, liver, kidney, spleen, or brain can be irreparably damaged by excessive pressure application to these wound sites. In this project, we developed a gel and spray which can be applied to injuries on soft tissue to prevent excessive blood loss. This gel/spray is prepared using chitosan, which is considered the second most abundant biopolymer on this planet. The gel also contains a non-steroidal anti-inflammatory drug and antibiotic silver nanoparticles. Tri-polyphosphate was used to prepare cross-linked chitosan nanoparticles, and the degree of crosslinking was varied to understand the effect of cross-linking density on the strength of the gel. The morphology of the nanoparticles was investigated using scanning electron microscopy (SEM), while the degree of cross-linking was confirmed using Fourier transform infra-red (FTIR) spectroscopy. Our results suggest a novel strategy and potential biomaterial for soft tissue engineering applications.

1. **INTRODUCTION**

One novel way to solve several problems associated with treatment of TI to soft tissues lies in the creation of a unique, tunable gel or sprayable polymer material. This gel/spray polymer material would need to cover the site of an injury or wound while applying enough pressure to minimize the risk of uncontrolled hemorrhage. Since soft tissue injuries are sensitive in terms of pressure application, it's of equal importance that this gel/spray polymer material applies only the amount of pressure required to prevent further injury.

The two main components of the spray/gel polymer material created in this project are chitosan (CS), a natural polymer that is compatible with the human body, and the cross-linker tripolyphosphate (TPP). CS and TPP form a strong gel upon mixing and the strength of the gel can be fine-tuned by varying the concentration of the TPP. This novel combination of components used to make the spray/gel also has the potential for the addition of other substances which aid in the healing process, like anti-inflammatory drugs and antibiotic nanoparticles. Ideally, having a readily available spray for use on tissue wounds would decrease the likelihood of death due to TI, as the spray can be used immediately to seal the wound from further contamination and initiate the healing process.

Process

There are many important factors to consider when deciding upon the final formulation of the gel/spray, the first of which being the degree of crosslinking. The physical and mechanical properties of the gel can be optimized by altering the degree of crosslinking. The gel becomes either stronger or weaker depending on the degree of crosslinking. The degree of crosslinking also affects the ability of the gel to absorb and hold different drugs, as well as the ultimate flexibility once the material is dry. A higher level of crosslinking creates a stronger gel, which is subsequently more stiff and non-absorbing, versus the weaker gel created by a lower level of crosslinking, which is more flexible and prone to swelling. In this project, we varied the degree of crosslinking by changing the concentration of TPP. The degree of crosslinking achieved for each concentration of TPP evaluated was determined by using fourier-transform infrared (FTIR) spectroscopy. The effect that the degree of crosslinking had on the physical properties of the gel were also studied. Some of the physical properties studied were swelling, water absorption, and water retention.

Other important factors to consider are the gelation time and temperature. Gelation is considered complete when the crosslinking reaction rate reaches a plateau and eventually stops. Typical gelation times can range from a few minutes to several hours, making it important to determine what range is optimal for soft tissue injury applications. The gelation time for this project was varied while other variables, like TPP and CS concentration, were held constant to determine the optimal time for gelation. FTIR spectroscopy was utilized to identify whether the gelation time affected the degree of crosslinking for a given TPP concentration. The previously mentioned physical properties were also studied across the varied gelation times.

Since most soft tissue injuries occur in the abdomen area, it's important to determine dependence of gelation on variations in body temperature. While the normal body temperature in the abdomen region is 37 degrees Celsius, fluctuations may occur due to external forces. For example, a lower body temperature than normal can result from prolonged exposure to the elements, and conversely, higher body temperature can be a result of fever. The degree of crosslinking was again studied using FTIR spectroscopy, as were the physical properties.

The effect of pH on the physical and mechanical properties of the spray/gel is also important to ensure the gel also can be used universally throughout the body, regardless of acidic or basic conditions. In the case of a soft tissue injury where there is damage to the stomach or intestines, the pH in the abdomen can change drastically. The physical properties of the gel were studied at various pH levels to confirm the ability to use the gel, regardless of the pH at the injury site.

2. CONCLUSION

The eventual purpose of these results and experiments Is to create the gel and spray for practical use. By controlling the concentration of the gel components and the extent of crosslinking, a gel for controlling hemorrhage in soft tissue injuries can be formed. The gel created performs well within the range of conditions possible inside the human body, and maintains the flexibility to withstand shear forces seen in the average wound. The results obtained from these experiments and the future projections are a good indication that the creation of the optimal gel formulation is well within reach. It's important to note that more data is needed for the eventual commercialization and manufacture of the gel, and these experiments are ongoing.

Effects of Water Flow on Hair Bundles in *Nematostella vectensis*

Allison Campbell[1], Ashlyn Dykes[2], and Patricia Mire, Ph.D.[3]
[1]Department of Biology, arc3452@louisiana.edu
[2]Department of Biology, amd3228@louisiana.edu
[3]Department of Biology, pmire@louisiana.edu

ABSTRACT

Hair bundles mechanoreceptors are used to detect flow, vibrations, and gravitational forces in many animals, including sea anemones (Watson, Mire, & Kinler, 2009). This experiment investigates the progressive effects of water flow on hair bundle morphology and density in the sea anemone, *Nematostella vectensis*. Over a period of two months, the experimental group was exposed to water flow for one hour every week day. Control anemones were cultured in the absence of flow. Over this period, two anemones were analyzed from both the experimental and control cultures every other day to observe the progressive effect of the water flow. For each of the forty anemones, three tentacles were used per anemone and three pictures were taken per tentacle. For each picture, the density was calculated using the number of hair bundles divided by linear distance of the tentacle edge in the picture. The morphology for each hair bundle was obtained by measuring the length of each hair bundle and its width at the base, middle, and tip. An ANOVA was used to determine statistical significance of the hair bundle lengths and densities within treatment groups. Both density and hair bundle length were significantly affected during the time series for the experimental group. Hair bundle density was not significantly different during the time series for the control group; however, hair bundle lengths in controls were significantly different during the time series. To further analyze at which time points significant differences were occurring, a post-hoc test was performed on both groups. The post-hoc results showed that in the experimental group the hair bundles were significantly longer than those in the beginning of the experiment after the 5th time point at day 10. The post-hoc results of the control group showed there were random differences in the lengths, but with no discernible pattern.

Key Words: Nematostella, hair bundle, current

1. INTRODUCTION

Nematostella vectensis is a model organism used in the study of developmental biology because it shares certain ancestral features in its genome (Sullivan & Finnerty, 2007). *Nematostella* have also been found to either share or have analogs of key genes involved with hair cells of the acousticolateralis system of vertebrate animals (Watson, Mire, & Kinler, 2009). Based on previous research, it has been shown that water flow for an hour every week day over a month will produce significant changes in hair bundle length and widths of the base and tip.

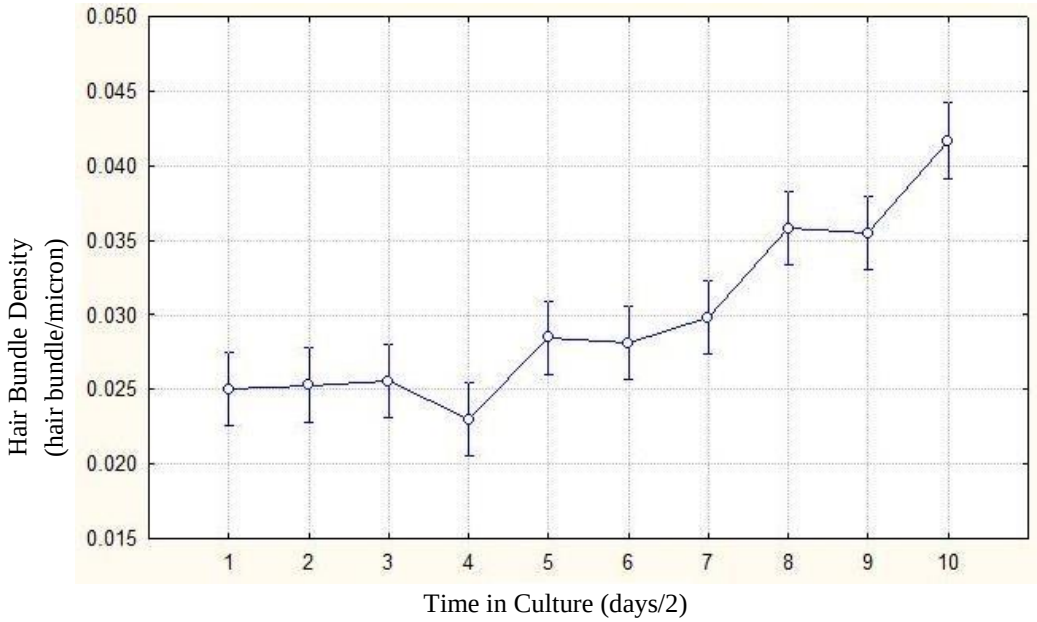
This research showed that the length of the hair bundles increased, the base of the hair bundle increased, and the width of the hair bundle tip decreased in response to water flow. The current study investigated the minimum time required to result in the changes to hair bundle morphology seen previously and to determine if the effects of the water flow are progressive.

2. METHODS

Twenty anemones each were placed in identical control and experimental culture dishes with identical amounts of sand and 16 ppt (parts per thousand) seawater. The anemones were fed twice a week with brine shrimp nauplii. Over a period of two months, the experimental group received water flow for an hour every week day. To obtain progressive results, two anemones were analyzed out of each culture every other day, giving ten different time points to analyze. The anemones were anesthetized with 1X Potassium seawater for 1 hour, and then their oral disks were removed and placed in fixative for at least 30 minutes. After being washed in 1X Phosphate-Buffered Saline (PBS) solution, wet mount slides were prepared to view and photograph the tentacles using phase contrast microscopy and a 100X oil immersion lens. For each anemone, three tentacles were randomly selected, and three pictures were taken of each tentacle. The density of the tentacle was measured by dividing the number of hair bundles by the length of the tentacle edge in the picture. The morphology of the hair bundles included measuring the length of the hair bundle and width at the base, middle, and tip. Measurements were made using ImageJ software.

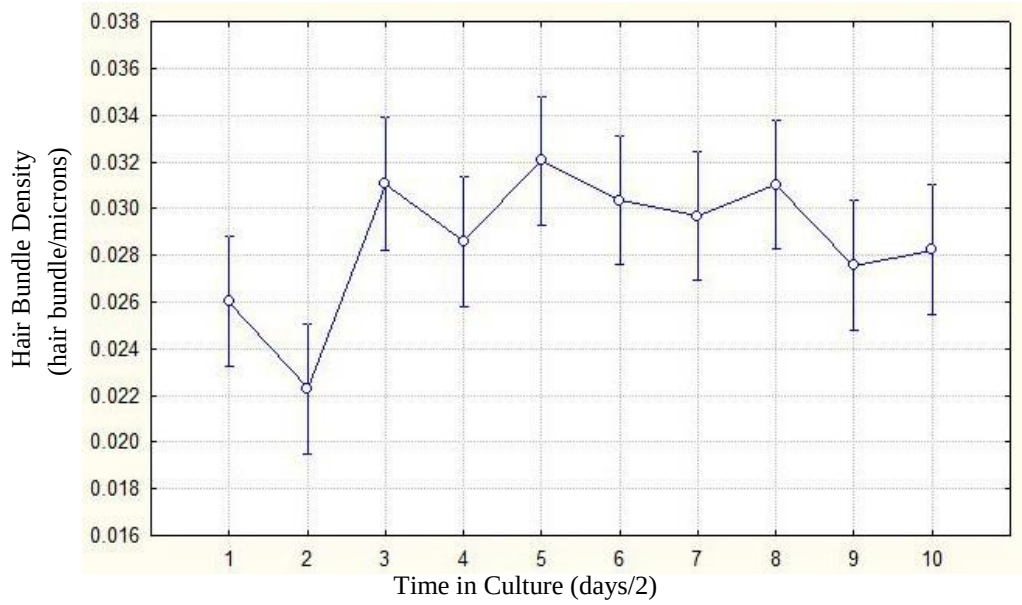
3. RESULTS

An Analysis of Variance (ANOVA) was performed on the densities and hair bundle lengths for both the control and experimental groups to determine statistical significance. On the graphs from the ANOVA, each data point shows the mean and standard deviation for each time point. For the hair bundle densities that were exposed to flow, the graph of the means exhibits a clear trend showing a direct relationship between hair bundle densities and exposure to the water flow (Figure 1), and the p-value showed that these results are significant ($p=0.00000$). The ANOVA done on the control densities gave a p-value of 0.37330 indicating no significance (Figure 2). The ANOVA for both the experimental and control group gave significant p-values as seen in Figure 3 for the experimental group and Figure 5 for the control group. To further analyze significant differences in time points, a post-hoc was performed. The post-hoc on the experimental time points (Figure 4) revealed that in the experimental group, the hair bundle lengths obtained at longer time points were consistently significant from the earlier time points starting at time point 5 (day 10). The post-hoc done on the control group (Figure 6) showed that there were no time points that were significantly different from the first time point and that the variables that were significant from each other were randomly dispersed.



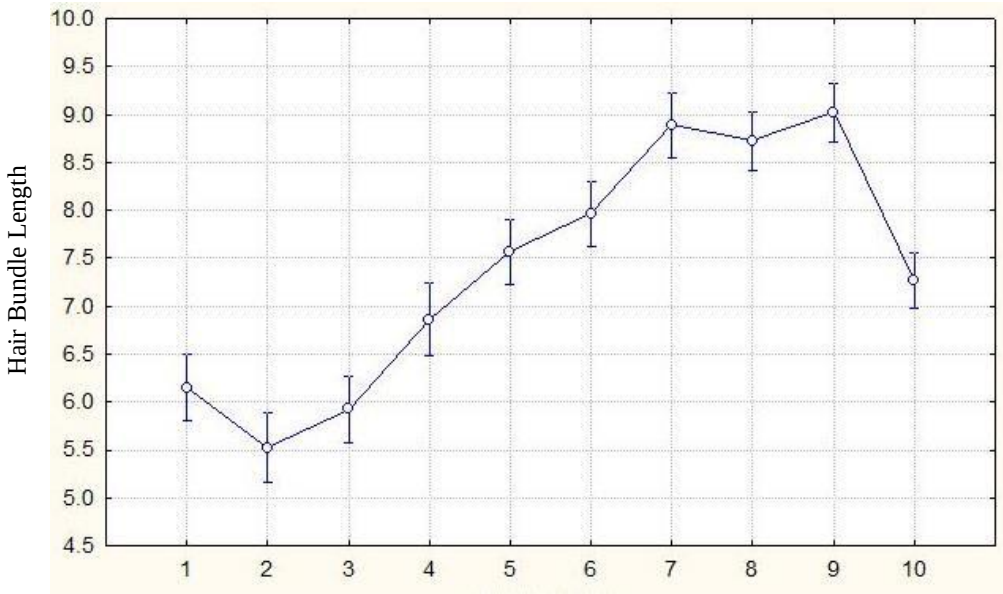
p-value = 0.00000

Figure 1. Experimental (water flow): hair bundle density vs. time (every two days)



p-value: 0.37330

Figure 2. Control (stagnant water): hair bundle density vs. time (every two days)



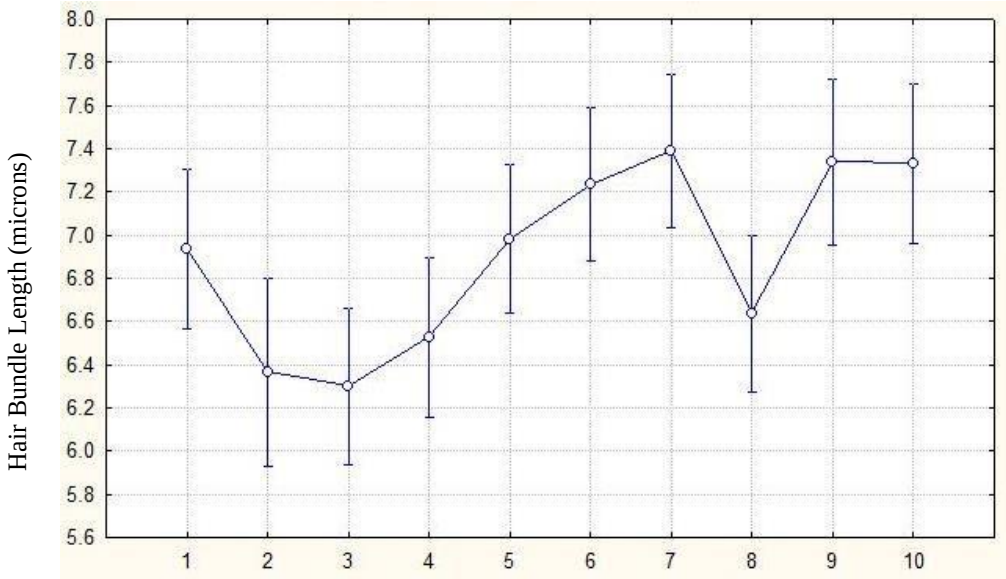
Time in Culture (days/2)

p-value = 0.00000

Figure 3. Experimental (water flow): Hair Bundle Lengths vs. time (every two days)

Exp Treatment	{1} 6.1493	{2} 5.5224	{3} 5.9240	{4} 6.8640	{5} 7.5673	{6} 7.9659	{7} 8.8890	{8} 8.7213	{9} 9.0195	{10} 7.2649
1		0.305194	0.996803	0.164147	0.000013	0.000012	0.000012	0.000012	0.000012	0.000066
2	0.305194		0.867483	0.000032	0.000012	0.000012	0.000012	0.000012	0.000012	0.000012
3	0.996803	0.867483		0.012628	0.000012	0.000012	0.000012	0.000012	0.000012	0.000013
4	0.164147	0.000032	0.012628		0.161282	0.000878	0.000012	0.000012	0.000012	0.814760
5	0.000013	0.000012	0.000012	0.161282		0.831866	0.000014	0.000032	0.000012	0.943083
6	0.000012	0.000012	0.000012	0.000878	0.831866		0.005614	0.035156	0.000231	0.060387
7	0.000012	0.000012	0.000012	0.000012	0.000014	0.005614		0.999280	0.999912	0.000012
8	0.000012	0.000012	0.000012	0.000012	0.000032	0.035156	0.999280		0.932282	0.000012
9	0.000012	0.000012	0.000012	0.000012	0.000012	0.000231	0.999912	0.932282		0.000012
10	0.000066	0.000012	0.000013	0.814760	0.943083	0.060387	0.000012	0.000012	0.000012	

Figure 4. Experimental (water flow): Post-Hoc Hair Bundle Lengths vs. time (every two days)



Time in Culture (days/2)

p-value = 0.00000

Figure 5. Control (stagnant water): Hair Bundle Lengths vs. time (every two days)

Var1	{1} 6.9340	{2} 6.3657	{3} 6.2996	{4} 6.5283	{5} 6.9832	{6} 7.2349	{7} 7.3917	{8} 6.6380	{9} 7.3407	{10} 7.3319
1		0.626997	0.323213	0.883282	1.000000	0.978782	0.766719	0.982636	0.894370	0.892328
2	0.626997		1.000000	0.999924	0.461740	0.068730	0.012077	0.994885	0.032150	0.028167
3	0.323213	1.000000		0.997392	0.180471	0.010773	0.001055	0.955160	0.004409	0.003388
4	0.883282	0.999924	0.997392		0.755837	0.168373	0.032655	0.999994	0.083109	0.073648
5	1.000000	0.461740	0.180471	0.755837		0.992232	0.839347	0.940578	0.939410	0.938592
6	0.978782	0.068730	0.010773	0.168373	0.992232		0.999838	0.379688	0.999996	0.999998
7	0.766719	0.012077	0.001055	0.032655	0.839347	0.999838		0.102821	1.000000	1.000000
8	0.982636	0.994885	0.955160	0.999994	0.940578	0.379688	0.102821		0.213737	0.198002
9	0.894370	0.032150	0.004409	0.083109	0.939410	0.999996	1.000000	0.213737		1.000000
10	0.892328	0.028167	0.003388	0.073648	0.938592	0.999998	1.000000	0.198002	1.000000	

Figure 6. Control (stagnant water): Post-Hoc Hair Bundle Lengths vs. time every two days)

4. DISCUSSION

Water flow near anemone in nature is indicative of a nearby food source, causing them to elongate their tentacles in preparation for prey capture. This agrees with the post-hoc of the experimental group showing that there was a consistent increase in the hair bundle lengths with greater exposure to water flow. In the experimental graph from the ANOVA and post-hoc, it appears that the hair bundle length increase dropped off at time point ten, which could indicate that there is an optimal period of time for the greatest amount of growth to occur; however, without a longer experiment it is impossible to determine if there is actually a consistent drop or whether it is a coincidence. The control post-hoc done for the hair bundle lengths showed that no time point is significantly different from the first time point. This lack of pattern indicates that the significant p-value was due to random variations in the data as opposed to a significant

increase in the hair bundles over time. Figures 3 and 5 also show that the experimental group is more consistent than the one shown by the control group. The increased length of the hair bundles in the group exposed to water flow could indicate that the hair bundles have acclimated to the new tune of the increased water flow.

The p-value of 0.0000, as seen in Figure 1, indicates that water flow caused the tentacles to produce significantly more hair bundles. The increase in hair bundle density could be indicative of a healthier animal with increased ability to sense and catch prey. The correlation of water flow and the growth of the anemone in both the hair bundle density and length shows that stimulation from the water flow increases the overall health and functionality of the hair bundle. Both acclimations could be due to the anemone either maintaining or enhancing their sensitivity to their prey in the condition of increased water flow.

Because of *Nematostella's* analogous structures to animal acousticolateralis systems, the increase in hair bundle density in response to stimulation from the water flow could potentially be used in remediation in vertebrate hair bundle growth. Further research into the increase in the density of hair bundle cells could eventually be useful in the study of deafness due to loss of hair bundles in vertebrate ears.

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Functionalization of Chitin Nanowhiskers: Applications Ranging from Biomedical to Construction Materials

Caleb Chauhan[1], Melanie Sanders[1], Dilip Depan[1*]
[1]Chemical Engineering Department, Institute for Materials, Research and Innovation, University of Louisiana at Lafayette
*ddepan@louisiana.edu

ABSTRACT

Chitin, next to cellulose, is the most abundant biopolymer found in nature. In recent years, its potential applications in several fields of research have been extensively studied for many reasons. It can be utilized as a waste product, since it is readily found as one of the main constituents in crustacean shells, making it very eco-friendly and inexpensive to manufacture. However, chitin's use is limited due to its low solubility in organic solvents; so it is often modified to more practical structures, including chitosan and chitin nanowhiskers. This discussion focuses on two promising applications for chitin nanowhiskers: to improve the physical properties of concrete and for use in biomaterial research. The first of which analyzed how chitin nanowhiskers could be cross-linked with a plasticizer to increase the mechanical strength of concrete, while also decreasing its viscosity. The second project studied the effect that crosslinking nanowhiskers onto chitosan had on the improvement of its physical and mechanical properties of scaffolds. Fourier transform infra-red (FTIR) analysis was performed on pure chitin and chitin nanowhiskers to verify that the two were identical; and scanning electron microscopy (SEM) images were taken to show the difference between each, in terms in size and geometry. To determine the extent of cross-linking, these images were then compared to an FTIR analysis of the cross-linked nanowhiskers for each respective project. In addition, SEM photos were taken of the chitosan-chitin nanowhisker scaffolds and of pure chitosan scaffolds to evaluate any difference in pore size, shape, and distribution for the second study. Overall, the goal of this research is to determine how chitin nanowhiskers can be applied for real world applications.

Key Words: Chitin, chitin nanowhiskers, cross-link hybrids, concrete

1. INTRODUCTION

The purpose of this research is to test the potential improvements that can be made with the addition of chitin nanowhiskers (CH-NWs) for two different studies: the first application being for use in concrete. Because concrete is so commonly used and relied upon by the average person, the first study was performed with the intention of correcting a significant obstacle often encountered in the process of mixing concrete. Concrete is usually comprised of three key components: water, a blend of rock, sand, and/or gravel, and Portland cement. Depending on the constructional project being worked on, varying amounts of water will be added to increase or decrease the viscosity of the mixture. However, problems tend to arise because of the inversely proportional relationship between the amount of water added and the resulting strength of the concrete. To fix this issue, the prepared CH-NWs were functionalized with a plasticizer, then

added to the concrete mixture. These functionalized nanowhiskers not only increase the mechanical strength of the concrete, but also improve its fluidity.

The second portion of this study focused on the ways that the CH-NWs could be utilized in bone tissue engineering. Three-dimensional scaffolds are often fabricated for use in tissue engineering as a support material on which bone cells can be grown. The objective for this experiment is elucidate the effect of crosslinking CH-NWs onto chitosan with blocked isocyanate hexamthylene-1,6-di-(aminocarboxysulfonate) (HDS) had on the physical properties of the scaffolds when compared to scaffolds of chitosan alone. Examples of the physical properties studied were water absorption, retention, and swelling.

2. PROCEDURE FOR MAKING CHITIN NANOWHISKERS

The preparation of CH-NWs began with the acid hydrolysis of chitin. Two grams of chitin were added to 60 mL of hydrochloric acid and the resulting slurry was mixed for 6 hours by continuous stirring and heating at 104 ^{o}C. To neutralize the acid, the solution was centrifuged 3 times at 10,000 rpm for 10 minutes. The pellet from each centrifugation was dispersed in deionized (DI) water and sonicated to ensure proper dispersion. The final turbid supernatant collected was then further neutralized using dialysis tubing. Once neutral, the solution was stored in a freezer at -20 ^{o}C until freeze dried for 24 hours at 0.420 mBar to obtain the chitin nanowhisker powder.

A very small amount of the CH-NWs powder was dispersed in acetone and a few drops were applied to a glass coverslip and allowed to dry. The glass coverslip was fastened to a metal stub which was gold-coated for scanning electron microscopy (SEM) analysis to confirm the presence of nanowhiskers. Similarly, the stock chitin powder was dispersed in acetone and analyzed in an identical fashion to determine the change in geometry and size distribution of chitin. Fourier-transform infrared (FTIR) spectroscopy was performed on both the stock chitin powder and the CH-NWs powder to confirm that no unintentional chemical alterations occurred.

Once the CH-NWs powder was prepared, HDS and the plasticizer were then synthesized and cross-linked with the nanowhiskers for each corresponding project.

3. SYNTHESIS OF HDS AND PREPARATION OF CROSS-LINKED SCAFFOLDS FOR USE IN BIOMEDICAL RESEARCH

The process for making HDS was as follows: Eight and a half grams of sodium metabisulfite ($Na_2S_2O_5$) was dissolved in 15 mL of DI water and stirred for 1 hour at room temperature. Seven grams of hexamethylene diisocyanate (HDMI) was then added to the solution and left to stir for 20 hours at room temperature. The resulting turbid liquid was added to an excess of acetone for precipitation, and the white precipitate was collected by vacuum filtration. The white powder was dried overnight at 37 ^{o}C. The subsequent product was dissolved in 30 mL of DI water and any insoluble particles were removed by filtration. The HDS was then re-precipitated with acetone for a second time, the white precipitate was collected by vacuum filtration, and the white powder was dried overnight at 37 ^{o}C to obtain the final product.

To prepare the cross-linked chitosan-chitin nanowhisker scaffolds, 2 grams of chitosan was dissolved in 100 mL of 2% acetic acid at room temperature by magnetic stirring until fully dissolved, but for a time not less than 24 hours. Different amounts of CH-NWs were added to the chitosan solution, in terms of weight percent (0%, 2%, 5%, 10%), and left to stir for 24 hours. To cross link the CH-NWs to the chitosan, HDS was added in quantities of 5 wt. % compared to the total amount of chitosan and chitin for each respective group. This mixture was then stirred for 48 hours at 60 ^{o}C, and porous scaffolds were prepared using lyophilization techniques.

4. SYNTHESIS OF THE PLASTICIZER FOR USE IN CONCRETE STUDIES

Cross-linking the CH-NWs with the plasticizer began by mixing 5 grams of CH-NWs with 3 grams of maleic anhydride in 50 mL of DI water. This solution was mixed at 90 ^{o}C by magnetic stirring for 3 hours. The solution was cooled down to 60 ^{o}C and 20% sodium hydroxide was added dropwise to the solution to adjust the pH to approximately 6.5. The mixture was returned to the magnetic stirrer and heated to 70 ^{o}C while being stirred for one hour before adding sodium metabisulfite to the solution dropwise for 30 minutes. The temperature was increased to 80 ^{o}C, while stirring the solution for another 2 hours. After this step, the solution cooled down to room temperature and was neutralized to a pH of 7.0, which was then repeatedly precipitated using an acetone/methanol mixture followed by a methanol washing. The product obtained was dried under vacuum at 50 ^{o}C overnight to obtain the fully functionalized CH-NWs.

5. CONCLUSION

Because chitin is so widely affordable, accessible, and exhibits such beneficial characteristics, its applications within the scientific community are limitless. In this research, one of the derivatives of chitin (chitin nanowhiskers) was studied for two potential applications. Although more studies need to be performed to fully understand the properties of the chitin nanowhiskers, the conducted experiments demonstrate very promising developments for this compound in the near future.

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Pregnancy and the Laboratory: A Female Perspective on Laboratory Safety

Brittney Comeaux[1], Ryan Simon[2]
[1]1100 Robley Dr. Apt. 8107 Lafayette, LA 70503, Senior Undergrad at the University of Louisiana at Lafayette, bnc1664@louisiana.edu
[2]104 East University Avenue Lafayette, LA 70504, Instructor of Chemistry at the University of Louisiana at Lafayette, ryansimon@louisiana.edu

ABSTRACT

Very little is known about the causes of complications during pregnancy. The first three months of pregnancy are crucial for the development of the organs and limbs of the fetus. If a mother is exposed to certain chemicals, this development can be hindered and may result in a spontaneous abortion. In the later months of pregnancy, exposure to chemicals can slow down the growth of the baby and effect brain development. For a mother who chooses to breastfeed, exposure to certain chemicals may affect the production of milk and can transfer some of those chemicals to the baby if certain safety precautions are not taken. In most cases, in order for the chemical to harm the fetus or to transfer to the breast milk, the mother must ingest the chemical. However there are some that can be transferred by inhalation or transdermally. Companies are required by law to provide a Safety Data Sheet to their employees which lists all of the chemicals that are found in the work environment. Along with this list and guidance from a medical professional, it is possible for a mother to continue working in the lab setting as long as some extra safety precautions are made. It is important to understand what chemicals and what amount of these chemicals are harmful to a mother and her baby.

Key Words: safety, pregnancy

1. INTRODUCTION

Exposer to certain chemicals can be harmful to both men and women. Reproductive hazards for men and women include: radiation, cigarettes, some viruses and alcohol. Infertility, miscarriage, low birth weight, are problems that face working and nonworking women. For women who work in places where reproductive hazards are prominent, it is important that they be informed of what these hazards are and how they affect their body. A reproductive toxicant is an agent that causes an adverse effect on the reproductive ability of an organism (Quigley et al., 2009). The reproductive tissues in women are controlled mostly by hormones. When reproductive hazards enter the body, these hormones are altered and infertility, menstrual cycle changes, changes in breast milk production and miscarriages may occur. Harmful substances can enter a woman's body through inhalation, transdermally (through the skin), or through ingestion. The first trimester of pregnancy is the period of which exposure to harmful chemicals may result in a birth defect or miscarriage. The second and third trimester is the period in which the development of the brain and birth weight of the baby are primarily effected.

When a woman becomes pregnant, her body produces a hormone, human chorionic gonadotropin, which tells the body to support the pregnancy. When the egg attaches to the fallopian tubes the placenta forms between the uterus and the fetus. This placenta allows the mother's body to transfer nutrients and oxygen to the fetus to help development. When reproductive hazards enter a woman's body, they can pass through her blood and enter the placenta and cause harm to the developing fetus. When a mother is exposed to radiation, the

rays may pass through the mother and attack the fetus directly. A mother can also pass toxins through her breast milk. The overall effect of the reproductive hazard depends on how much of the chemical they are exposed to, how long they are exposed to it, when they are exposed to it and how they are exposed.

There is no universally accepted method for determining a chemical's reproductive toxicity, the LD_{50} is used as a baseline that at that specific dosage of exposure to a chemical, fifty percent of those exposed will die (Quigley et al., 2009). As mentioned previously, the length of time for which a woman is exposed to a potentially harmful substance is a factor in how it will affect her body and her child. An acute exposure is usually less than 24 hours of exposure to a toxin. A sub-acute exposure is usually less than a month. Sub-chronic exposure refers to 1-3 months and chronic exposure refers to more than three months (Quigley et al., 2009). For exposure that is sub-chronic or chronic, the concentration of that chemical may be higher if a women is more frequently exposed and can therefore have a greater effect on her. The rule from Hazard Communication that is typically used as a general rule for determining toxicity is that if one percent of a mixture contains a reproductive toxin than it is considered a hazard to women (Quigley et al., 2009). This rule cannot always be applied but it is used as a good starting point for potential hazards.

The first trimester is the most critical in the development of the fetus. During this period, all of the major organs and body parts are being formed and the baby is most susceptible to birth defects do to reproductive toxins ("If I'm Pregnant," 2007). The last sixth months of pregnancy are when the fetus' brain continues to develop and where exposure to harmful chemicals can effect this brain development or possible cause preterm births. High level disinfectants such as ethylene oxide gas, hydrogen peroxide gas, plasma, glutaradelhyde, orthophthaladehyde, peracetic acid, and formaldehyde have shown to have played a role in higher risk for miscarriages and preterm birth for women who have been exposed to these types of chemicals in the workplace ("Learn about exposures"). The levels of toxicity are still unknown but caution is advised if one will be around them while pregnant. Epoxies and resins have also been linked to risk for fertility problems, miscarriages, stillbirths, and birth defects. It is unknown what amount of exposure is safe for pregnant women. Radiation can also increase reproductive problems and birth defects. Although it has been linked to these problems, it cannot be said for certain that the radiation was the sole cause for the difficulties. Exposure to heavy metals can increase chances of miscarriages, still births and brain developmental problems for the baby. Gases such as carbon monoxide are extremely toxic to the fetus. The exposure can cause problems with the baby's nervous system as well as result in miscarriage or birth defects ("Learn about exposures"). Organic solvents have been linked to miscarriages, stillbirths, preterm births, low birth weight babies, and babies with birth defects. All of these chemicals have shown to be potential factors in complications with pregnancy, however it is not known what level of exposure is safe for the mother or the fetus and therefore women should also be conscience of potential workplace hazards.

Women who are breastfeeding their baby should also be aware of potential hazards as many may enter the breast milk and then be introduced to the baby. Levels of formaldehyde found in certain laboratories, can enter the breast milk of a nursing mother and be transmitted to the baby. Levels of safe exposure are unknown and it is not known how much exposure is necessary for the chemical to enter the milk ("Learn about exposures"). Heavy metals that enter a mother's body can travel to the breast milk and then enter the baby's body. Pesticides can also enter the breast milk and be passed on to the baby. Organic solvents such as toluene, methyl acetate, hexane, xylene, and benzene are able to pass through the breast milk to the baby. Safe levels for heavy metals, pesticides, and organic solvents are unknown and it is

recommended that breastfeeding mothers limit their exposure to these harmful substances (“Learn about exposures).

In Europe, when women formally inform their employer that they are pregnant, the company is required by law to conduct a risk assessment of the workplace in order to ensure the safety of the mother and her unborn child (Pain, 2006). In the U.S. there are no such laws in place however, in any workplace where chemicals are readily used, the office is required to have a Safety Data Sheet (SDS) that contains a list of all the chemicals present (“If I’m pregnant,” 2007). The SDS is the best place for a woman to start in order to ensure the safety of herself and her child throughout the pregnancy. This list can be brought to her doctor’s office and the potential hazards can be assessed and together they can determine the safest option for her to be able to continue to work. Overall the most important thing a woman can do is to practice lab good lab safety, working in properly ventilated areas, avoid direct contact with chemicals that are known to cause greater harm to the fetus, wear gloves, and protective clothing (“Learn about exposures”) and be aware of what they are exposed to.

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Disrupted Families, Parental Loyalty Conflict and Psychological Maltreatment: Evidence for the Importance of Family Court-Mandated Programs

Caitlin Daigle[1], Elizabeth F. Bakies[2] and Theresa Wozencraft[3]
[1]3601 Kaliste Saloom Road Apt 708 Lafayette, LA 70508, University of Louisiana at Lafayette, caitlintdaigle@gmail.com
[2]104 Fanfare Lane, Lafayette, LA 70507, University of Louisiana at Lafayette, efakie2@gmail.com
[3]627 Bellevue Plantation, Lafayette, LA 70503, University of Louisiana at Lafayette, wozencraft@louisiana.edu

ABSTRACT

This study, an extension of the work of Baker and colleagues (2013, 2014, 2016) explored the relationship between parental union intactness and parental loyalty conflicts; as well as the relationship between parental loyalty conflicts and psychological maltreatment. Parental loyalty conflicts are actions taken by parents that affect their child's relationship with, perception of and access to the other parent (Baker & Brassard, 2013). Psychological maltreatment of a child can be considered any treatment that is harmful to the child's emotional well being. Unlike much of the standing literature, this study includes multiple forms of intact and nonintact parental units to better reflect current social trends (Arias, Heron, & Xu, 2016). Based upon prior research it was expected that participants would report experiencing higher levels of parental loyalty conflicts when their parents were in non-intact unions. It was also predicted that higher reported parentally mediated conflict behavior would be associated with higher reported experience of psychological maltreatment. Two hundred-forty college students were recruited from a Southern university to take a digital questionnaire in a supervised lab setting, where informed consent and debriefing were provided. Participants' scores on the Baker Strategies Questionnaire (BSQ) (Baker & Chambers, 2011), measuring the frequency of parental loyalty conflicts in intact versus nonintact parental unions, were compared using a t test. Relevant psychological maltreatment items were chosen from the Maltreatment and Abuse Chronology of Exposure scale (MACE) (Teicher & Parigger, 2015), and were compared to BSQ scores using a Pearson's correlation. As predicted, participants with non-intact parental unions reported significantly higher BSQ scores than participants with intact parental unions ($t = -2.86$, $p < .005$; Cohen's $d = .37$) A Pearson's correlation revealed a strongly significant and positive relationship between BSQ scores and psychological maltreatment scores ($r = .61$, $p < .0001$). Clinicians may address potential problems associated with parental loyalty conflicts more proactively by understanding the clear patterns of risk to children whose parents are in nonintact unions. The results also suggest that family-court mandated programs are likely an underutilized resource for improving parenting and ultimately children's adjustment (Wolchik, Shenck, & Sandler, 2009).

1. BACKGROUND

This study, an extension of the work of Baker and colleagues (2013, 2014, 2016) explored the relationship between parental union intactness and parental loyalty conflicts; as well as the relationship between parental loyalty conflicts and psychological maltreatment. Parental loyalty conflicts are actions taken by parents that affect their child's relationship with, perception of and access to the other parent (Baker & Brassard, 2013). Parental loyalty conflicts experienced by

children still living with one or both parents have been found to have a relationship with diminished emotional well-being of the child and later, young adult (Baker & Brassard, 2013; Baker & Eichler, 2014). Psychological maltreatment of a child can be considered any treatment that is harmful to the child's emotional well being, such as emotional neglect as well as emotional abuse. Previous studies have found a connection between psychological abuse, family conflict, and adolescent emotional well-being (Bahere, Basnet, & Campbell, 2017; Teicher & Samson, 2016). This study includes multiple forms of intact and nonintact parental units to better reflect current social trends (Arias, Heron, & Xu, 2016). Status of parental union was based upon participant responses to family history questions. Non-intact parental units were defined as never married and no longer/never living together and married but not living together. Based upon prior research it was expected that participants would report experiencing higher levels of parental loyalty conflicts when their parents were in non-intact unions. It was also predicted that higher levels of reported parental loyalty conflict behavior would be associated with higher levels of reported experience of psychological maltreatment.

2. METHOD

Participants enrolled in psychology courses were recruited through SONA, a research participant management program. Students were brought into a computer lab and administered informed consent and debriefing by a trained experimenter or research assistant. Students completed the digital questionnaires while being supervised by research assistants. The 240 participants (M = 20 years, Range 18-27) consisted of 173 females, 63 males, 2 'other' and 2 did not indicate gender. Intact parental units were defined as parents who live together but were never married, parents that divorced but are currently living together or parents who are married and live together. More descriptive statistics are in Table 2.1

Parental loyalty conflict behavior was measured using the Baker Strategies Questionnaire (BSQ; Baker & Chambers, 2011). The BSQ is a 20-item scale measuring the types and frequency of parental loyalty conflict engendering behaviors experienced by the participant. Types of parental loyalty conflict behavior represented are making it difficult for the participant to communicate with the other parent or fabricated or exaggerated the other parent's negative qualities. The items were rated on a 0 (never) – 4 (always) frequency scale. Participants mark how frequently each parent engaged in each of the 20 behaviors, making the range of possible scores from 0-160 for any given participant. Psychological maltreatment was assessed using a subscale of the Maltreatment and Abuse Chronology of Exposure scale (MACE; Teicher & Parigger, 2015). The MACE is a 52–item assessment of the experience of various types of abuse. The psychological maltreatment variable in this study included items from the parental verbal abuse, parental nonverbal abuse, and emotional neglect subscales. The MACE provides an extensive chronological history of abuse by asking the participant to mark any abuse that was experienced in 3 year intervals from ages 1-18. Participants were asked to indicate which possible caretaker(s) had enacted the abuse; namely, parent, stepparent, parent's girlfriend or boyfriend, and mother figure or father figure. Additionally, one item to measure the occurrence of sexual abuse was utilized, based upon a sexual abuse item from the Conflict Tactics Strategies Parent-Child assessment (Straus, Hamby, Finkelhor, Moore, & Runyan, 1998). This sexual abuse item was formatted identically to the MACE items for consistency of measurement.

2.1 Tables and Figures

Table 1.

Demographics of Participants

Gender		Age		Parental Union Status	
Female	173	Range	18-69	Intact	135
Male	63	Mean	20.2	Nontintact	100
Other	02	SD	6.2	Unidentified	05
Blank	02				

3. RESULTS

Data were analyzed using the statistical program JMP 13. Descriptive statistics for the major variables are presented in Table 3.1. A one-way ANOVA was utilized to examine whether parental loyalty conflict (BSQ) was significantly different between the two parental union status groups. The significant difference found between the two groups is represented in Figure 3.1. The hypothesized relationship between parental loyalty conflict (BSQ) and psychological maltreatment (MACE) were evaluated by Pearson's r. The result of the Pearson's r analysis is found in Figure 3.2.

3.1 Tables and Figures

Table 2.

Descriptive Statistics for Variables

	n	Overall Mean	SD	Range
PLC	239	15.6	20.7	0-120
PSYC ABU	204	15.44	19.3	0-97

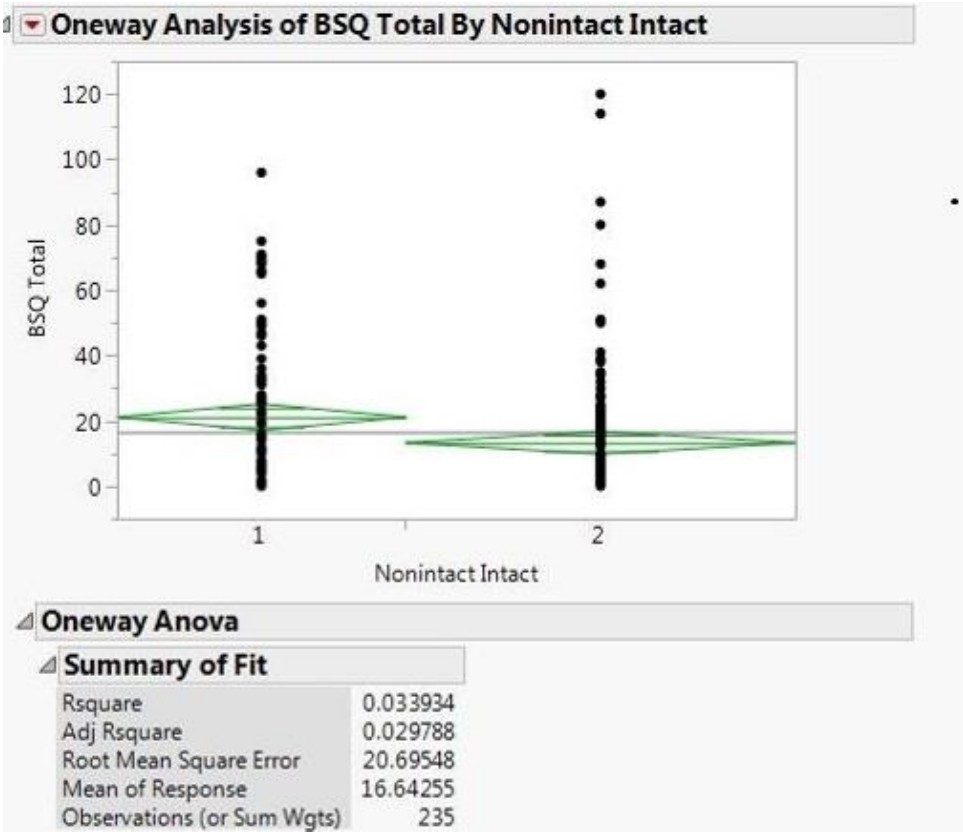

Figure 1.

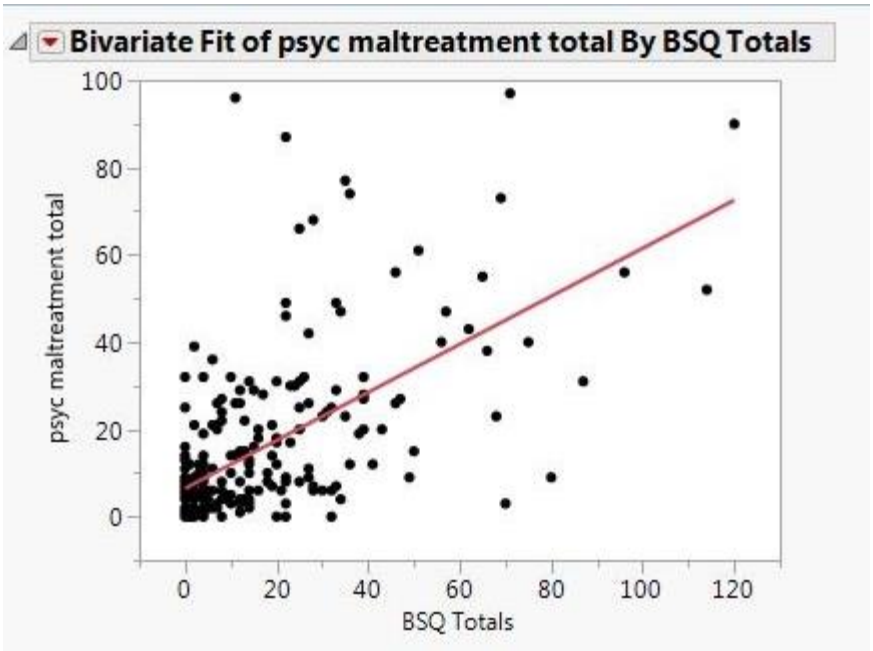

Figure 2.

4. DISCUSSION

As predicted, analyses revealed a significant difference in reported parental loyalty conflict experienced between students from intact versus nonintact families. Students from nonintact families experienced significantly higher levels of parental loyalty conflict. However, the fact that some participants with intact parental unions reported high levels of parental loyalty conflict is worth noting. The second hypothesis was also supported with a strong correlation between parental loyalty conflict experienced and psychological maltreatment from a parental figure. These results suggest that 40% of our sample had parents that could have benefitted from an intervention meant to eliminate or lessen parental loyalty conflict behavior. Furthermore, this study indicates that parents exhibiting high levels of parental loyalty conflicts would benefit from family-court mandated programs targeting parent skills training and parental conflict resolution. The confirmation of the second hypothesis suggests that it may be prudent to screen children for psychological maltreatment in cases where parental loyalty conflict exists.

Some limitations of the study are its cross-sectional nature. Information taken at one time point is susceptible to drawbacks like cohort effects. The self-report method can lend to biases and error from memory recall in this particular scenario. The sample was a convenience sample taken from one department of a university, rather than a larger sample taken from all departments of the university.

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Effects of Mortality Salience on News Media Interpretation

Trey M. Delcambre[1], Brooke O. Breaux[2], & Hanh Annie Vu[3]
[1]University of Louisiana at Lafayette, t.delcambrenp@gmail.com
[2]University of Louisiana at Lafayette, brookebreaux@louisiana.edu
[3]University of Louisiana at Lafayette, hanhannievu@gmail.com

ABSTRACT

This study investigates the relationship between news media interpretation and mortality salience (MS), a hypothesis central to management theory (TMT; Solomon, Greenberg, & Pyszczynski, 1991). TMT suggests that investing in shared cultural worldviews serves to manage anxieties that arise when humans are confronted with death related thoughts. More specifically, the MS hypothesis seeks to explain how people appear to defend themselves when confronted with a belief, source of information, or cultural out-group member that does not agree with their own values or worldview. This has been observed as either aggressive acts towards perceived out-group members or worldview defense gestures such as heighted expression of beliefs that give individuals a sense of purpose and meaning. This research sought to explore how participants might respond to news stories that may run counter to their own beliefs when mortality is made salient through an MS induction. The MS induction involved asking participants to reflect on and write about the experience of their own death. Following this induction, participants were asked to read a randomly selected, mostly false news story from a hyper-partisan news source. Participants were then asked to (1) levy a fine on those responsible for circulating false information, (2) morally judge the news sources' monetization of the content, and (3) report the extent to which they would agree with Facebook filtering out similar news content. Data analysis showed that participants' responses to these MS effect questions following the MS induction did not differ according to the article's political orientation (left vs. right) or according to the participant's political affiliation (Republican vs. Democrat). Although this finding is not in line with current MS literature, we argue that the relationship between terror management theory and media perception is worth exploring further.

Key Words: Terror Management Theory, Media Psychology, Politics.

1. INTRODUCTION

According to terror management theory (TMT; Solomon, Greenberg, & Pyszczynski, 1991), humans are uniquely able to process abstract modes of thought. Considering one's inevitable death is a product of this ability, and the anxiety resulting from this ability is managed by a person's belief and participation in culturally meaningful worldviews, such as the explicit immortality offered in Abrahamic religions or implicit notions of continuation after death offered by the continuation of political ideals.

Since its inception, the most frequently tested and reliable effect in TMT is that of mortality salience (MS; Burke, Martens, & Faucher, 2010). MS studies involve getting people to think about their own death. Researchers have found that when mortality is made salient, a process occurs outside the level of consciousness whereby existential threats influence an

individual to cling tightly to those shared values, which provide a sense of purpose and meaning. As a further observation, elevated levels of aggressions are enacted towards those who are perceived to be outside the culture with which MS participants identify. TMT has the potential to explain why humans have the tendency to form tribes and distinguish between those who are considered "within the group" and those "outside the group".

The United States has not only been experiencing an increase in political polarization; a wedge has also been driven into how the public interacts with and interprets the news media available to them. The term *fake news* has been used extensively in civic discourse to discredit particular news sources that are perceived to be hyper-partisan or inflammatory in nature (Potthast, Kiesel, Bevendorff, & Benno, 2017). Since allegations of fake news can be viewed as a derogatory towards perceived out-group members, researchers for this study were interested in how MS inductions might motivate individuals to become more aggressive towards news stories that express views which run counter to their own beliefs and values. The question this study attempts to address is as follows: Given that participants are informed that the news story they read are mostly false, would MS influence their moral judgments and their willingness to impose a financial penalty on those responsible for sharing false information? Also as a means of worldview defense, would they desire to be shielded from similar news stories?

2. METHOD

2.1 Participants

Thirty-five students enrolled in at least one psychology course at the University of Louisiana at Lafayette completed this study via SurveyMonkey.com in a controlled lab setting. Participants signed up via SonaSystems, the Psychology Department's Subject Pool, and received credit in their psychology course.

2.2 Materials

Participants were randomly presented with one previously published news story obtained from the Buzzfeed-Webis Fake News Corpus 2016 (as cited in Potthast et al., 2017). The news stories were professionally determined as containing mostly false information and as having a political orientation of left (*Addicting Info*, *Occupy Democrats, The Other 98%*) or right (*Eagle Rising*, *Freedom Daily*, *Right Wing News)*. Each news story was brief and contained information about the 2016 presidential election.

2.3 Procedure

Before the experiment, participants were lead to believe they were taking part in a study that examined reading and writing. Informed consent was obtained, and participants proceeded to answer a standard set of demographic questions about their age, gender, classification, native language, and any other languages with which they are familiar.

Then participants were randomly assigned to either an MS condition, where they were asked to reflect on and write about the experience of dying, or a control condition, where they were asked to reflect on and write about the experience of a dental surgery procedure.

Next participants read one randomly selected news story. Participants then answered a series of comprehension questions about the news story that were followed by two distractor tasks: a set of three analogies and a word search puzzle. Meta-analyses have shown that moments of distraction or delay allows death-thoughts to fall below conscious awareness, typically resulting in stronger MS effects (Burke et al., 2010).

Then participants were asked three questions designed to test the effects of the MS induction: Participants were asked to (1) levy a fine on those responsible for circulating false information, (2) morally judge on a 5-point Likert-type scale the news sources' monetization of the content, and (3) report on a 5-point Likert-type scale the extent to which they would agree with Facebook filtering out similar news content. This was followed immediately by a death-thought accessibility measure to determine the effectiveness of the MS induction procedure.
Finally, participants were given a series of questions measuring individual differences which addressed centrality of religion (Huber & Huber, 2012), right-wing authoritarianism (Zakrisson, 2005), and uncritical patriotism (Huddy & Khatib, 2007). Participants finished the study by answering a few more demographic questions, such as their political orientation, political affiliation, and how often they seek our source information. During the debriefing, we explained to participants that we were not in fact interested in their reading or writing but were actually investigating how thoughts related to their own death would influence their interpretation and responsiveness to news stories that potentially conflicted with their own worldviews.

3. RESULTS

The data associated with participants that did not answer the comprehension questions correctly (n = 1) were removed from further analysis. These results focus on our analysis of the three questions we designed to test the effects of the MS induction.
Two one-way between subjects ANOVAs were conducted to compare the effect of Story Orientation (left vs. right) and Political Preference (Democrat vs. Republican) on the morality ratings and Facebook filter ratings: one for the MS condition and one for the control condition. Only one significant effect emerged from these analyses. Democrats provided significantly lower moral judgement ratings (M = 2.67, SD = 1.21) as compared to Republicans (M = 4.11, SD =.78), but only when asked to reflect on and write about the experience of a dental surgery procedure. When participants were asked to reflect on and write about the experience of dying, a similar, but nonsignificant, trend was observed (M_D = 3.17, SD_D = .98 ; M_R = 3.50, SD_R=1.40). Because participants' responses to the penalty question were open-ended, we found that responses ranged from zero dollars to two million dollars. Only two participants gave responses of over one million dollars and they were both in the dental surgery condition. Due to the wide range of variability in participants' responses and the fact that we only analyzed data from 35 participants, we conducted a Nominal Logistic analysis with this data to look at the effects of Story Orientation and Political Preference for each condition. The analysis revealed no significant effects of Orientation or Political Preference on the size of the monetary penalty that participants' levied against news sources distributing false information. This null result could be due to having too small of a sample size, having a weak MS induction, or there being no real differences in participants' aggression across these factors.

4. DISCUSSION

The only significant effect found in our current analysis is inconsistent with the MS literature; however, the fact that Democrats generated lower moral judgement ratings as compared to Republicans is consistent with the finding that left-leaning individuals tend to be more open to perceived out-group members and are less likely to judge them harshly (Kosloff, Landau & Burke, 2016). Despite these initial findings, we plan to further analyze this data set with a focus on how participants' scores on the centrality of religion (Huber & Huber, 2012), right-wing authoritarianism (Zakrisson, 2005), and uncritical patriotism (Huddy & Khatib, 2007) correspond to their responses to our MS questions. Our future research efforts will focus on improving our MS induction, collecting data from more participants, and refining our MS effect questions. We

argue that the relationship between terror management theory and media perception is worth exploring further.

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D33 Testing of Piezoelectric/Carbon Nano-Fiber Composites

Christian Gary[1], Ryan Saucier[2], Tyler Hacker[3], Oluwakemi Ajala[4], Ahmed Khattab Ph. D.[5]

[1]Christian Gary, University of Louisiana at Lafayette, Laboratory of Composite Materials, Undergraduate Apprentice, cmg4515@louisiana.edu

[2]Ryan Saucier, University of Louisiana at Lafayette, Laboratory of Composite Materials, Undergraduate Apprentice, rxs1821@louisiana.edu

[3]Tyler Hacker, University of Louisiana at Lafayette, Laboratory of Composite Materials, Undergraduate Apprentice, c00295379@louisiana.edu

[4]Oluwakemi Ajala, University of Louisiana at Lafayette, Laboratory of Composite Materials, Graduate Apprentice, kemi@louisiana.edu

[5]Ahmed Khattab Ph. D., Associate Dean of Engineering, University of Louisiana at Lafayette, Laboratory of Composite Materials, khattab@louisiana.edu

ABSTRACT

Piezoelectric ceramics are used in a number of industries for their sensing capabilities, and in some cases power generation. By effectively generating a voltage potential under loading, and vice versa, piezoelectric ceramics aided in the development of sonar, ultrafine focusing of optical instruments, microphones, and even push-start propane barbecues. One solution for an alternate source of energy has been the integration of piezoelectric ceramics with road and highway systems to harvest lost kinetic energy from vehicles.

Amongst various piezoelectric materials lead zirconate titanate (PZT) ceramics have distinctive energy conversion functions. Nanomaterials, such as carbon nanofibers (CNF), hold the potential to redefine the field of traditional materials both in terms of performance and potential applications. CNF have a high performance per cost ratio and good interfacial bonding with the matrix materials. CNF are an economical alternative to carbon nanotubes (CNT) and more easily manufactured. In this study, PZT ceramics will be modified with CNF to enhance its piezoelectric effects.

Testing was performed on CNF/PZT disc samples to find the amount of charge produced in the test material due to applied dynamic load known as the d33 value. Samples were made by mixing pre-measured CNF and PZT and pressing each of the mixtures in a cylindrical mold before cooking them. The developed CNF/PZT samples were subjected to vertical forces that activated the materials' charge output. Each mixture had a different percentage of CNF in it, allowing for the examination of the difference in production of charge based on the amount of CNF it contained.

1. INTRODUCTION

The purpose of performing d33 nondestructive testing on a piezoelectric material is to find the amount of charge that material produces per unit of force that is applied to it. Piezoelectric materials, otherwise known as PZT, are ceramics that produce small variations of charge after loads are applied to them. Optimization of the outsourced charge was tested by adding Carbon Nano-Fibers (CNF) to PZT samples and observing how their implementation affected the materials' d33 constants. CNF are nanoscopic strands of graphene that have been found to

improve the intensive mechanical properties of any material when they are added by altering the material's nano-structure, such as specific strength and specific toughness.

The procedure of making the composite sample involves a mixture with total mass of under 8 grams of PZT powder and CNF, with the CNF content being between 0% and 1%. The mixture is placed in a cylindrical mold and pressed in a pneumatic press to form a small brittle cylinder about 0.8 centimeters in height and 1 centimeter in diameter. The brittle sample is placed in an open-top crucible and inserted into furnace, heated at 650 degrees Celsius for 1 hour. This phase in the experiment, known as the debinding process, removes the binder, in this case wax, from the PZT powder used. After cooling from the debinding process, the sample is then heated at 1125 degrees Celsius for 1 hour to solidify the ceramic material in a process known as sintering. The sintered test specimen is cooled and non-destructive testing is performed using a d33 meter, which calculates the charge that is produced by the material when a force is administered to it. The d33 meter calculates this constant value by applying a force on the sample that is held in between its vibrating probes. The dynamic force allows for charge to be found in the vertical direction of polarization of the sample.

2. RESULTS

Results from d33 testing found that samples with higher percentages of CNF in them, as high as 1 %, possessed greater d33 values than that of a pure PZT and other lower percentage samples. These values reached over 3 pico-Coulombs per Newton with the 1% CNF sample in comparison to below 3 pico-Coulombs per Newton for the pure PZT sample. The findings show that CNF could be optimizing the charge output of the samples, proving that their implementation in PZT materials can allow for electrical innovations in society.

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How Ethnicity, Family Structure, and Parent-Child Relationships Shape Attitudes Regarding Premarital and Casual Sexual Behavior in College Students

Celia Gauthier
University of Louisiana at Lafayette

ABSTRACT

As time goes on, people's attitudes towards premarital sex have become more open and accepting. Especially, the attitudes of young adults, such as college students, are more accepting than older adults. However, there is likely a difference among those young adults depending on their backgrounds, such as their SES or religion. Hence, the current study will examine the possible features that affect college students' attitudes toward premarital sexual engagement, including family structure, ethnicity, parental attitudes, and relationships with parents. The survey will be distributed to undergraduate students under various majors at the University of Louisiana, Lafayette. Surveyed students will range from age 18 to age 25 (the age range of "emerging adulthood"). Data will be collected via a hand-out style written survey.

1. INTRODUCTION

In studies conducted through the 1990s and early 2000s (e.g., Flewelling & Bauman, 1990; Furstenberg & Teitler, 1994; Kieman, 1992), a number of studies have supported the idea that individuals from any non-traditional family structure were more likely than their counterparts to engage in premarital sexual activities. More recent studies found that individuals from single-parent households are more likely to be permissive of premarital sexual behaviors (Browning, Leventhal, & Brooks-Gunn, 2004). However, Anagurthi, Johnson, & Somers (2011) concluded that family structure has no impact on whether or not an individual will engage in premarital sexual activities. Additionally, results indicated that parental attitudes as well as parental relationships with children do have an effect on their children's attitudes towards premarital sex (Anagurthi, Johnson, & Somers 2011).

Other factors have been identified as a predictor of young adults' attitudes toward premarital sex. Some of these factors include how certain they are of their life goals, their level of self-esteem, and if they were educated about sex at a young age (Anagurthi, et al., 2011). Ethnicity has also been studied as a possible factor. It has been found that non-Hispanic males are more likely to engage in premarital sexual activity earlier in their lives than Hispanic males are (Upchurch, Aneshensel, Mudgal, & McNeely, 2001). In a study conducted by Uecker (2008), researchers found that African American Protestants were engaging in premarital sex at an elevated rate.

The current study hypotheses are as follows:

1. Individuals from minority backgrounds (African American, Hispanic, et cetera) will be more accepting of and more likely to engage in premarital sexual behaviors.
2. The family structure these individuals were raised in will impact their attitudes regarding premarital sexual behaviors.
3. There will be an interaction effect between ethnicity and family structure. In other words, individuals from a "non-traditional" family structure (i.e., a single-parent household) with

ethnic minorities (i.e. Hispanic) will be more likely to have accepting attitudes toward and to engage in premarital sexual behavior than white individuals from two-parent households.

4. Individuals with more positive relationships with their parents/guardians will be less likely to engage in premarital sexual behaviors.
5. Individuals who are goal-oriented and foster high self-esteems will be less likely to engage in premarital sex than their low self-esteem peers.

Catalytic Synthesis of Substituted Benzimidazoles Using Transition Metal Phthalocyanines, Pyridinoporphyrazines, and Pyrazinoporphyrazines

Charles R. Genovese III[1] and Phillip D. Voegel[2]
[1]Department of Chemistry & Physics, Southeastern Louisiana University, charles.genovese@selu.edu
[2]Department of Chemistry & Physics, Southeastern Louisiana University, phillip.voegel@selu.edu

ABSTRACT

A one-pot microwave synthesis method has been employed to prepare transition metal phthalocyanine, tetra-2,3-pyridinoporphyrazine, tetra-3,4-pyridinoporphyrazine, and tetra-2,3-pyrazinoporphyrazine catalysts containing cobalt, copper, and iron. Their catalytic properties were examined through the one-pot syntheses of 2-(4-nitrophenyl)-1H-benzimodazole and 2-(4-chlorophenyl)-1H-benzimidazole from *o*-phenylenediamine and the appropriate *p*-benzaldehydes. Addition of water to the reaction mixtures leads to precipitation of the benzimidazole products which are isolated through vacuum filtration. Isolated yields for reaction mixtures containing 0.56 mol% catalyst are compared statistically to the yields of comparable reactions using, as suggested by the literature, 310 mol% ammonium chloride as the catalyst.

Isolated yields of 2-(4-nitrophenyl)-1-H-benzimidazole ranged from 65 – 84% using each of twelve catalysts after refluxing for 30 minutes in ethanol. Isolated yields of 75±1% were obtained with the ammonium chloride catalyst after refluxing for 120 minutes in ethanol. Of the catalysts included in this study, only iron(II)tetra-2,3-pyrazinoporphyrazine produced statistically lower yields compared to ammonium chloride catalyzed reactions ($P = 0.004$). Three catalysts, cobalt(II)tetra-2,3-pyrazinoporphyrazine, cobalt(II)tetra-2,3-pyridinoporphyrazine, and copper(II)tetra-3,4-pyradinoporphyrazine produced statistically higher yields ($P < 0.01$). The largest yields, 84±3%, were obtained with copper(II)tetra-3,4-pyridinoporphyrazine as the catalyst. Copper(II)phthalocyanine has been used to successfully synthesize 2-(4-chlorophenyl)-1H-benzimidazole and its synthesis with the remaining catalysts are in progress.

Key Words: Catalysis, Synthesis, Benzimidazole

1. INTRODUCTION

A wide range of biological activities have been reported for benzimidazole compounds including anti-cancer (Azam, 2015; Moukhoopadhyay, 2002; Sharma, 2017) and antibacterial (Chikkula, 2017; Navarrete-Vazquez, G., 2001; Viswanath, 2017) properties. This work focuses on the synthesis of 2-phenyl-1H-benzimidazoles through the catalytic coupling of *o*-phenylenediamine and *p*-benzaldehyde derivatives. This synthesis has been reported using many catalysts including ceric ammonium nitrate (Sadek, 2012), cobalt(II)chloride (Khan, 2009), sodium hydrogen sulfite (Lopez, 2009), *p*-toluenesulfonic acid (Xiangming, 2007), and zirconium oxychloride (Nikalje, 2014). Metal phthalocyanines and the related pyridinoporphyrazine and pyrazinoporphyrazine catalysts have been used in a wide range of catalytic applications and have been the focus of previous work in this laboratory. With the high potential impact of benzimidazoles in the preparation of pharmaceutical compounds this work compares the isolated yields of 2-(4-nitrophenyl)-1H-benzimidazole using 12 transition metal phthalocyanine,

pyridinoporphyrazine, and pyrazinoporphyrazine catalysts (Figure 1) for comparison to yields produced through a published procedure employing ammonium chloride as the catalyst (Kathirvalen, 2013).

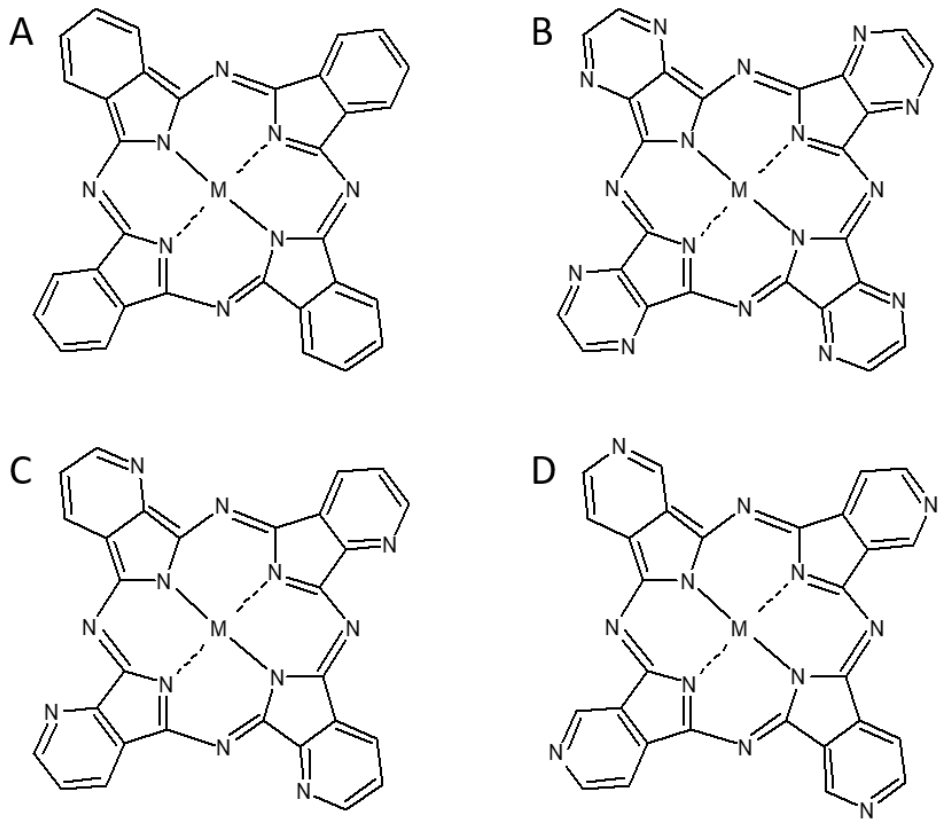

Figure 1. (A) metal phthalocyanine, (B) metal tetra-2,3-pyrazinoporphyrazine, (C) metal tetra-2,3-pyridinoporphyrazine, and (D) metal tetra-3,4-pyridinoporphyrazine. M = Co, Cu, or Fe.

2. METHODS

Metal phthalocyanine, pyridinoporphyrazine, and pyrazinoporphyrazine catalysts were synthesized according to methods outlined by Achar (Achar, 1987) where the initial dicarboxylic acid was modified from 4-nitrophthalic acid to produce the desired modifications to the ring system. The syntheses described here employ phthalic, 2,3-pyridinedicarboxylic, 3,4-pyridinedicarboxylic, and 2,3-pyrazinedicarboxylic acids as starting materials. To decrease synthesis time, the method was modified to employ microwave heating (Seven, 2009; Sharma, 2011). Briefly, metal phthalocyanine catalysts were produced by grinding a solid mixture containing 200 mg of a dicarboxylic acid, 0.3 mmol metal sulfate (cobalt, copper, or iron), 31 mg ammonium chloride, 345 mg urea, and 4 mg ammonium molybdate as a catalyst. The finely ground mixture was placed in a glass reaction bottle. The bottle was placed in a silica gel bath and then microwaved for two minutes, allowed to cool for one minute, and microwaved an additional two minutes. The solid product was transferred to a clean bottle for storage. When the same method was employed for the preparation of pyridonoporphyrazine and pyrazinoporphyrazine catalysts, nitrobenzene solvent was required. The product was isolated by vacuum filtration.

2-(4-nitrophenyl)-1H-benzimidazole and 2-(4-chlorophenyl)-1H-benzimidazole were produced according to methods outlined by Kathirvalen (2013) and modified to employ the metal phthalocyanine and related catalysts. In this synthesis, 0.92 mmol *o*-phthalic acid, 0.92 mmol *p*-nitrobenzaldehyde, and 3 mg (5×10^{-6} mol) catalyst were placed in 4 ml ethanol and refluxed for 30 minutes with constant stirring (Figure 2). The solution was filtered to remove the insoluble catalyst and the filtrate was placed in an ice water bath to cool. Cold distilled water was added dropwise until no further precipitation product was observed. The precipitate was then isolated by vacuum filtration and dried in an oven to constant weight at 105°C. All syntheses were repeated three or four times. The same method was employed for synthesis of 2-(4-chlorophenyl)-1H-benzimidazole.

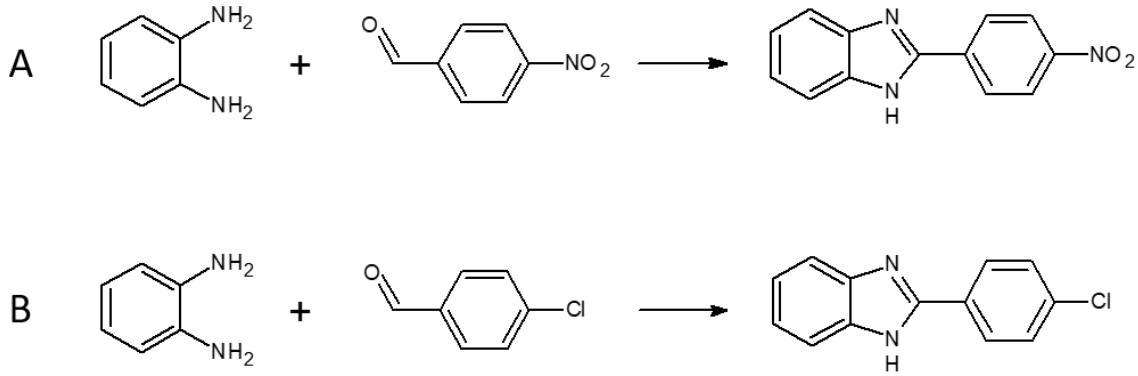

Figure 2. Reaction of *o*-phenylenediamine with (A) *p*-nitrobenzaldehyde to form 2-(4-nitrophenyl)-1H-benzimidazole and (B) *p*-chlorobenzaldehyde to form 2-(4-chlorophenyl)-1H-benzimidazole.

3. RESULTS AND DISCUSSION

The microwave modified solventless method (Sharma, 2011) for synthesizing metal phthalocyanines was effective; however, it did not work well for the synthesis of pyridinoporphyrazine and pyrazinoporphyrazine catalysts. The microwave method was modified to include nitrobenzene, the solvent used in the conventional synthetic method (Achar, 1987). With this modification, catalysts were formed in a fraction of the time required for the conventional method followed by isolation by vacuum filtration. Infrared spectra of the catalysts were consistent with previous work completed in this laboratory.

The primary goal of this work is the application of these catalysts for the synthesis of 2-phenylbenzimidazole derivatives and has focused on the synthesis of 2-(4-nitrophenyl)-1H-benzimidazole. One distinct difference between the literature method and this work is the relative amount of catalyst required. In the literature report, 310 mol% ammonium chloride is employed, while this work uses only 0.56 mol% catalyst, a nearly 550% decrease in the amount of catalyst employed. Even with much lower amounts of catalyst, all the catalysts employed produced similar to greater amounts of product compared to the ammonium chloride catalysis. The yields and 95% confidence limits using each catalyst are shown in Table 1. Only iron(II)tetra-2,3-pyrazinoporphyrazine with a yield of 65±3%

Table 1. Isolated percentage yields of 2-(4-nitrophenyl)-1H-benzimidazole

Catalyst	Isolated Yield	Number of Trials
Copper(II)tetra-3,4-pyridinoporphyrazine	84±3	3
Cobalt(II)tetra-2,3-pyridinoporphyrazine	80±3	4
Copper(II)tetra-2,3-pyridinoporphyrazine	79±3	4
Iron(II)phthalocyanine	78±5	4
Cobalt(II)tetra-2,3-pyrazinoporphyrazine	78±2	3
Copper(II)tetra-2,3-pyrazinoporpyrazine	77±2	4
Copper(II)phthalocyanine	76±6	3
Iron(II)tetra-2,3-pyridinoporphyrazine	76±3	4
Cobalt(II)phthalocyanine	75±7	3
Cobalt(II)tetra-3,4-pyridinoporphyrazine	75±4	4
Iron(II)tetra-3,4-pyridinoporphyrazine	75±2	4
Ammonium Chloride	75±1	3
Iron(II)tetra-2,3-pyrazinoporphyrazine	65±3	4

produced a smaller amount of product than ammonium chloride catalyzed reactions with yields of 75±1% (P = 0.0004). The isolated yields of 2-(4-nitrophenyl)-1H-benzimidazole using eight catalysts, ranging from 75±4% to 79±3%, were not statistically different from those produced using ammonium chloride. The three remaining catalysts, cobalt(II)tetra-2,3-pyrazinoporphyrazine with 78±2% yield, cobalt(II)tetra-2,3-pyridinoporphyrazine with 80±3% yield, and copper(II)tetra-3,4-pyridinoporphyrazine with 84±3% yield, produced statistically larger yields of the product than ammonium chloride (P = 0.01, P = 0.009, and P = 0.004 respectively). In addition to improvements in the yield, the method employed in this work reduced the reaction time from 120 minutes to 30 minutes. Using this method, 2-(4-chlorophenyl)-1H-benzimidazole has also been produced using copper(II)phthalocyanine as the catalyst. Synthesis of this product using the remaining catalysts is ongoing. NMR and FTIR analysis of the 2-(4-nitrophenyl)-1H-benzimidazole and 2-(4-chlorophenyl)-1H-benzimidazole products were consistent with the literature (Kathirvalen, 2013).

4. CONCLUSION

In this work, twelve metal phthalocyanine, metal tetrapyridinoporphyrazine, and metal tetrapyrazinoporphyrazine catalysts were using a modified microwave synthesis method. The catalysts have effectively improved the isolated yield of 2-(4-nitrophenyl)-1H-benzimidazole by up to 9% with a 75% reduction in reaction time. The most effective catalyst in this study was copper(II)tetra-3,4-pyridinoporphyrazine. Improvements in the efficiency and decreases in the time required to prepare 2-phenylbenzimidazole may lead to the synthesis of new molecules containing the 2-phenylbenzimidazole substructure with a shorter reaction time. A recent search (2017 October 23) using the structure search component of SciFinder Scholar® indicated there were 72 published articles either directly assessing the biological activity of the two 2-phenylbenzimidazole compounds synthesized in this work or using them as reagents in the synthesis of other biologically active compounds. For example, antibacterial activity against

B. subtilis, *E. coli*, *K. pneumoniae*, and *S. aureus* (Viswanath, 2017) and anti-inflammatory properties (Nikalje, 2014) were demonstrated for 2-(4-chlorophenyl)-1H-benzimidazole. Anti-cancer activity has been demonstrated using 2-(4-nitrophenyl)-1H-benzimidazole (Azam, 2015). Given the wide range 2-phenylbenzimidazole range of compounds, their use as reagents in the synthesis of related pharmaceutical compounds, and their potential importance in the direct development of pharmaceuticals, effective and rapid methods of synthesis such as the one demonstrated in this work must be developed and refined.

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Perceptions of Safety and Effectiveness in Two Bystander Scenarios

Aline Gossen[1] and Dylan A. John[2]
1 University of Louisiana at Lafayette, Student, amg5571@louisiana.edu
2. University of Louisiana at Lafayette, Student, daj3931@louisiana.edu

ABSTRACT

Sexual assault is a notable issue among men and women in society. Despite the high rates of sexual assault there are ways to reduce sexual violence such as bystander intervention. However, there are boundaries that bystanders face when intervening in a sexual violence: distraction, ignorance and ambiguity, failure to take responsibility, skills deficits, and audience inhibition (Latané & Darley, 1970). The purpose of this study is to measure the perceptions of effectiveness and safety of different intervention strategies and run a correlational analysis between the effectiveness and safety. The sample was drawn from the undergraduate psychology program at a southern university. Participants consisted of 72.5% female and 27.5% male with an average age being 19.61 (SD: 4.09). The vast majority of participants were white freshmen. There were two separate scenarios: a party scene and bar scene. Within each scenario, participates were asked to rate the effectiveness and safety of the options given a five-point Likert scale with 1 being “not at all” effective or safe and 5 being “very” effective or safe. Correlational analysis displayed mostly positive statistically significant correlations between the effectiveness and safety of the intervention strategies.

1. INTRODUCTION

Sexual violence is a notable issue among men and women in society. As indicated in a population survey, 58.5% of women and 19.1% of men report experiencing unwanted sexual contact, sexual coercion, or rape in their lifetime (Black et al., 2011). Despite the high rates, there are ways to reduce sexual violence: bystanders can reduce sexual assault before it is committed. However, some bystanders may choose not to become involved in a possible sexual assault. There are several reasons that may cause this bystander effect: the assumption that other bystanders are going to or have already provided assistance to the person in need (Darley & Latané, 1968), not know what the most effective intervention strategy is, or the bystanders’ fear for their own safety. It is important to note that in certain situations a bystander may be unaware that a sexual assault is occurring.

The purpose of this analysis is to examine bystander perceptions of efficacy and safety of sexual assault prevention strategies. The study provides two different scenarios in which sexual assault may occur: parties and bars. It is important to understand how bystanders rate the efficacy and safety of different prevention methods. Based on the study by Latané and Darley (1970), the five-barrier situation model of bystander intervention suggest that distraction, ignorance and ambiguity, failure to take responsibility, skills deficits, and audience inhibition may be barriers to bystander intervention. These barriers show that there is a need to determine the perceptions of safety and efficacy among different intervention strategies.

2. METHODS

Participants for this study were recruited through the university's undergraduate psychology program. Most participants reported their race as white, followed by black, and other races. The mean age of participants in the sample was 19.61 years old with a standard deviation of 4.09. The procedure involved asking the participants to fill out an anonymous online survey via SurveyMonkey after reading the two scenarios. Both scenarios involved the bystander walking in on a hypothetical sexual assault. Participants were given several options and asked to rate the safety and effectiveness of each option. The purpose of this analysis is to determine if there exists a correlation between how safe and how effective participants rated each option.

RESULTS

For the party scenario, 50% of the options for safety and effectiveness had a strong positive correlation (i.e., >0.3000). An exception to this was option A, "Close the door and walk away." This option was listed by most participants as not at all effective (M:1.27; SD: 0.0625), however, it was also listed as a moderately safe option by participants (M: 3.54 SD: 1.6206). For these two options, there was a negative correlation (-0.0382). Another exception was option B, "Physically pull him off her." This option was listed by most participants as moderately effective (M: 3.68 SD: 1.0757), however, it was also listed as not at all safe (M: 1.85 SD: 0.9670). These options had a low positive correlation (0.1653). Of the remaining options, only F and G had correlations with levels of significance greater than .001. The highest rated effective strategy of the options presented would be option I. "Get the girl out of the room" (M: 4.48, SD: 0.8761). The safest however, was different; participants rated "J. Call 911" as the safest option (M: 4.19, SD: 1.1723).

The highest rated option in terms of effectiveness was option A "Tell him to leave her alone and that you will find another ride home for her" (M: 4.14, SD: 1.0153). There was a positive correlation between the ratings of safety and effectiveness for this option (0.3346). The highest rated option in terms of safety was option I "Call police or other authority" (M: 4.30, SD: 1.0276). There was a positive correlation between how effective and how safe option I was (.3514). The lowest rated option in terms of effectiveness was option C. "Let him take her home" (M: 1.20, SD: 0.5913). There was a very slight positive correlation between option C's safety and effectiveness (0.0061). The lowest rated option in terms of safety was option G. "Punch him or push him out of the way" (M: 1.47, SD: 0.8149). There was a slight positive correlation between the effectiveness and safety of option G. (0.2565). For a full list of results for the bar scenario see Table 2.

A Coarse-Grained Model for Polyethylene Oxide

Gaurav Gyawali[1], Bryan Raubenolt[2], Wenwen Tang[3], Katy S. Wong[4], Steven W. Rick[5]

[1]Department of Chemistry, University of New Orleans, New Orleans, LA, ggyawali@my.uno.edu
[2]Department of Chemistry, University of New Orleans, New Orleans, LA, braubeno@my.uno.edu
[3]Department of Chemistry, University of New Orleans, New Orleans, LA, wtang@my.uno.edu
[4]Department of Chemical and Biomolecular Engineering, Tulane University, New Orleans, LA, kwong5@tulane.edu
[5]Department of Chemistry, University of New Orleans, New Orleans, LA, srick@uno.edu

ABSTRACT

A model for the polymer polyethylene oxide (PEO) is developed. This model gains efficiency by eliminating interaction sites on all hydrogen atoms and by eliminating all long-ranged interactions, including Coulombic interactions. Despite these simplifications, the model is able to accurately reproduce the structure and thermodynamics of pure ether compounds, ether compounds in water, and aqueous PEO.

Keywords: Polymers, computer simulation, coarse-graining

1. INTRODUCTION

Polyethylene oxide (PEO) and polyethylene glycol (PEG) are versatile polymers with a variety of applications in chemistry, biochemistry, materials, and manufacturing.[1] The amphiphilic nature of the polymer is evident in its complex phase behavior. It is water soluable at room temperature, but has a lower critical solution temperature (LCST) and is insoluable at temperatures above 85°C.[2] PEG/PEO can absorb on surfaces and interfaces, and insert into membranes.[3] Accurate molecular models for PEO need to get the correct amount of hydrophilicity and also ideally be computationally efficient for large scale simulations. Given the importance of PEO, and related ether compounds, a number of atomistic potentials have been developed.[4,5,6] There are also coarse-grained models, in which a single monomer is reduced to a single interaction site.[7,8] This manuscript describes a new model for aqueous PEO, which gains efficiency through the elimination of hydrogen interaction sites, including those on polar hydrogens, and through a reduction in the range of the potential, which includes the elimination of all long-ranged Coulombic interactions.

2. METHODS

Interactions between molecules use the Stillinger-Weber potential[9] includes two body and three body terms, as the two body term, ϕ_2, is similar to the more common Lennard-Jones potential, but shorter ranged, going to zero at a distance of aσ, and softer at small distances, with a power of 4 rather than 12. The three body term is purely repulsive and establishes the structure of the first solvation shell, with θ_0 being the desired angle between atoms i,j, and k, and i being the central atom. The potential has been developed for water,[10] methane,[11] and aqueous NaCl[12] by Molinero and co-workers and for long alkanes by Gyawali, *et al.*[13] In these models and the present model there are interactions on heavy atoms only. The course grained simulations were run with LAMMPS[14] and parameters were determined by optimizing against experimental thermodynamics data for liquid 1,2 dimethoxyethane (DME), DME/water mixtures, and aqueous PEO. Parameters were also optimized to reproduce radial distribution functions for liquid and

aqueous DME relative to other models.[6] All simulations were run at a temperature of 300 K and a pressure of 1 bar.

3. RESULTS

Properties of the model are given in Table 1. For the DME liquid, the density, enthalpy, and liquid/vapor surface are all in close agreement with experiment.[15-17] For DME in water, the free energy, enthalpy, and entropy are in good agreement with experiment.[18]

Table 1. Properties of liquid and aqueous 1,2-dimethoxyethane at 298 K.

	Model	**Experiment**
Density (g/cm^3)	0.864±0.002	0.861[15]
ΔH_{vap} (kcal/mol)	8.1±0.2	8.79[16]
Surface tension (nN/m)	26±2	23.9[17]
ΔG_{solv} (kcal/mol)	-6.4±0.1	-4.8[18]
ΔH_{solv} (kcal/mol)	-13.5±0.6	-14.2[18]
ΔS_{solv} (cal/(mol K))	-24±2	-31.5[18]

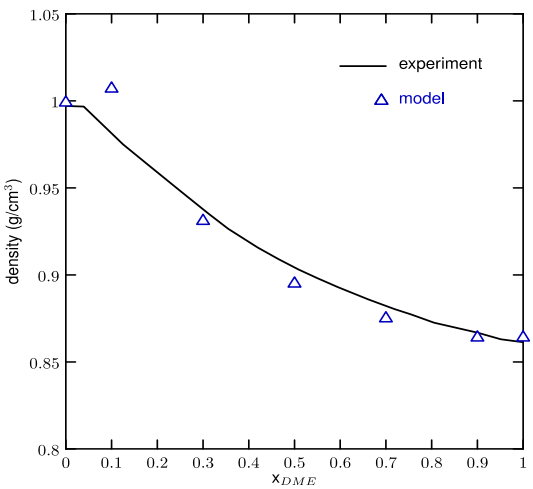

Figure 1. Density of DME/water mixtures.

In addition, the density as a function of mole fraction for DME/water mixtures agrees with experiment (Figure 1).[15] although the value at a small mole fraction (X_{DME}=0.1) is slightly overestimated. The radial distribution function between oxygen (O) and the CH_2 carbon for liquid DME shows similar structure to the modified TraPPE-UA model of Fischer, *et al,*[6] as can be seen in Figure 2A. Figure 2B shows the DME oxygen/water oxygen (Ow) radial distribution function comparing the present model to both the modified TraPPE-UA/TIP4P-Ew[6,19] and the Smith, *et al.*/TIP4P[5] (Figure 2B). There are some differences between the published models for the O-Ow correlation function, both in terms of the position and the height of the first peak. Our model gives two water molecules in this peak, in agreement with the Smith, *et al.* results. The TraPPE-UA model gives closer to one.

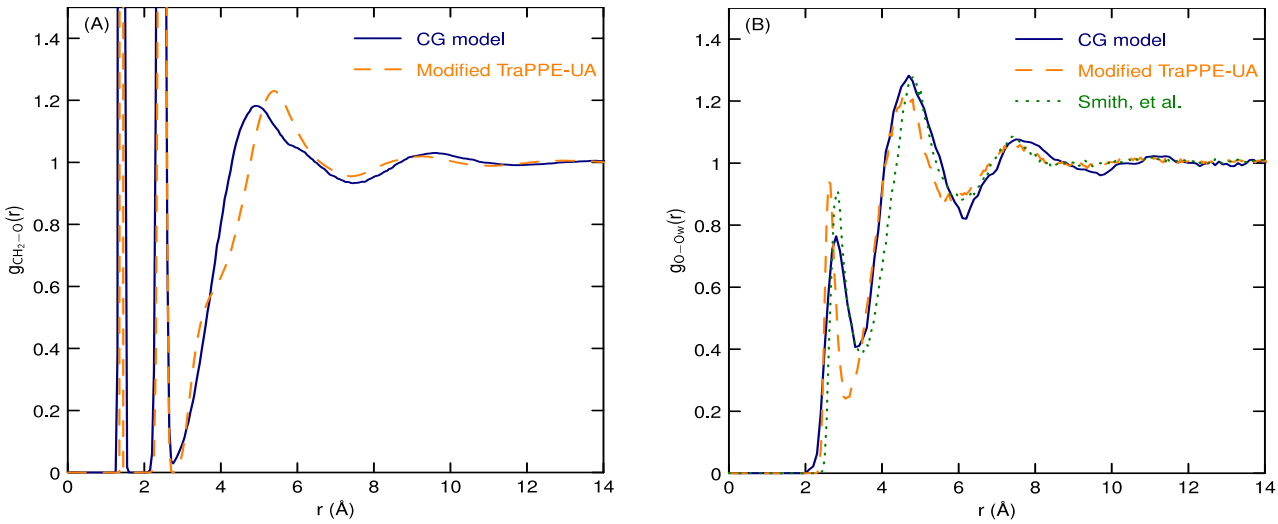

Figure 1. Liquid DME oxygen-carbon (A) and aqueous DME oxygen-water oxygen (B) radial distribution functions.

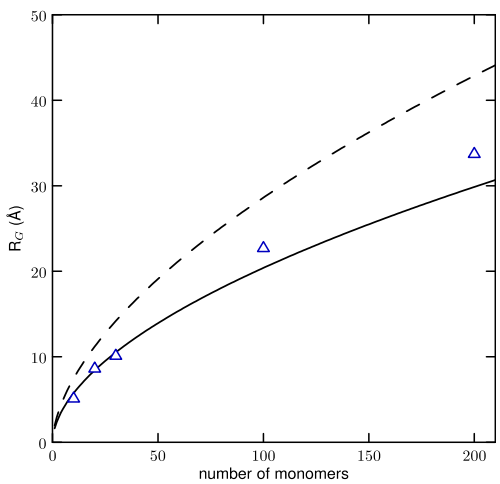

Figure 2. Radius of gyration of PEO.

From simulations of the PEO polymers of various lengths, the radius of gyration, R_g, can be found. The light scattering experiments of Kawaguchi, *et al*[20] and Devanand and Selser[21] find slightly different results. Our results are close to both (Figure 3), as are both atomistic[6] and course-grained models.[8] Experimentally, R_g scales as N, where N is the number of monomers. Kawaguchi, *et al* report an exponent of 0.550 and Devanand and Selser find 0.583. Our results give an exponent of 0.56.

4. CONCLUSION

Using the Stillinger-Weber approach, as extended to aqueous systems by Molinero and co-workers,[10-12] we were able to develop an accurate and efficient model for PEO. The model successfully reproduces thermodynamic and structural properties of liquid and aqueous ethers, showing that a successful model can be built which just includes interactions with nearest and next-nearest neighbors. All interactions rigorously go to zero at distances less than 7.5 Å. The large reduction in the number of interacting pairs allows for the simulation of large systems while still retaining molecular level detail.

5. ACKNOLEDGMENTS

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A Comparison of Two Measures of Identity Formation

Layne Hardy[1], Dylan Harrell, M.S.[2], and Valanne MacGyvers, Ph.D[3]

[1]Department of Psychology, University of Louisiana at Lafayette, laynehardy@gmail.com

[2]Department of Psychology and Behavioral Sciences, Louisiana Tech University, DylanHarrell93@gmail.com

[3]Department of Psychology, University of Louisiana at Lafayette, macgyvers@louisiana.edu

ABSTRACT

We are comparing the U-MICS measure of identity to the EOMEIS measure of identity to determine if the U-MICS can be used as an equivalent but more efficient means of collecting data on adolescent ego-identity development. Through correlational analyses, we will decide if these two measures are comparable. The EOMEIS is a well-established and reliable measure that has been in use for almost 50 years. It has a broad and well-respected body of literature behind it and is considered to be both reliable and valid. The EOMEIS was based on Erikson and Marcia's work in identity formation, a solidly "American" tradition. The U-MICS is a more recently developed measure, one that is rooted in European tradition of Identity research and measures concepts very similar to the EOMEIS. A sample of 397 college students completed both measures as part of an online survey for course credit. If the U-MICS is a valid measure of identity formation, specific patterns of scores were expected in the data. However, those patterns were not found and we have concluded that the U-MICS is not a good approximation of the Eriksonian model of identity formation, and may be of limited utility in identity research drawing on that tradition.

Key Words: Identity Formation; Adolescence; Measurement

1. INTRODUCTION

Since the introduction of Erik Erikson's theory of Identity formation and the development of the identity status groupings, the Extended Objective Measures of Ego Identity Status (EOMEIS), created by Marcia (1966), has become the most referenced measures of identity formation (Schwartz, Zamboanga, Wei, and Olthuis, 2009). The two key constructs of this measure are exploration and commitment. Exploration is the process of: realizing the need for a standard set of self-beliefs and attitudes; observing possible alternatives; and then seeking out alternatives that might meet a particular need. Commitment, the second key construct, is the process resulting from successful exploration, and now the person has identified the desired alternative and is committed to that path (Schwartz, et al., 2009; Marcia, 1966).Based on Erikson's (1963) theory, Marcia (1966) identified the four statuses of ego-identity: achievement, moratorium, foreclosure, and diffusion. Achievement status is characterized by a complete synthesis of identity, in which a person has completed a process of identity exploration and has committed to an identity standard (Schwartz et al., 2009; Marcia, 1966). Diffusion is the antithesis of an achieved status and is characterized by both the lack of exploration and a lack of commitment to any specific standard of identity. The two ego-identity statuses of moratorium, active exploration without commitment, and foreclosure, commitment with little or no exploration, are also included and considered to be more "in-process" statuses, in contrast to the more completed achieved

and diffused statuses (Schwartz, et al., 2009; Marcia, 1966). The EOMEIS, then yields scores for each of the identity statuses, and in general, the status with the highest score would be the true status for the individual.

In contrast, the Utrecht-Management of Identity Commitments Scale (U-MICS), developed by Crocetti, E., Schwartz, S. J., Fermani, A., & Meeus, W. (2010), is a measure coming from European researchers and measures the dynamic processes by which adolescents form their identities. In this approach, the emphasis is on the processes of identity formation, exploration and commitment, rather than on the actual status grouping. Further, in recognition that identity formation is a lifelong process, they had added a third process, one that must occur after commitment has been made, reconsideration. Thus, the U-MICS uses a three-factor identity model centered on the aspects of commitment, in-depth exploration, and reconsideration of commitment (Crocetti et al., 2008). In-depth exploration entails the adolescents' ability to think actively about their choices, reflecting on decisions made, inquiring into chosen and alternative commitments, and seeking of informative opinions and information from others about their choices and commitments. Commitment, in this model, involves enacting decisive life choices and the self-confidence one derives from those choices. These two constructs are similar to the ones utilized by Marcia in the EOMEIS (1966) The extent to which an adolescent thinks a commitment is satisfactory is indexed by the reconsideration of commitments scale, and is the last component of the U-MICS model (Crocetti et al., 2010). By definition, the reconsideration of commitment must occur after commitments are made. Therefore, we should expect to see the highest levels of this process associated with identity achievement.

Using the EOMEIS as the industry standard, this study examines the effectiveness of the U-MICS as a shorter and more efficient measure of Identity formation. Table 1 summarizes the expected relations between the two measures. Most notable is that, since reconsideration requires a commitment to an identity, it should be significantly related only to the achieved identity profile. Commitment should be strong for the Achieved identity and for the foreclosed identity, while exploration should be strong for achieved and moratorium.

2. METHODS

The Extended Objective Measure of Ego Identity Status (EOMEIS) is a 64-item, 5-point, Likert-scale questionnaire that elicits participants' ranging from 1 indicating "strongly disagree" to 5 "strongly agree." The four subscales of the questionnaire each have 16 questions pertaining to each section; each one measures the strength of the endorsement of each: identity-achievement (M = 58.87, SD = 8.75), identity-moratorium (M = 36.85, SD = 11.23), identity-foreclosure (M = 44.31, SD = 9.14), and identity-diffusion (M = 35.53, SD = 8.13). The identity-achievement subscale measures the strength of the commitment to choices subsequent to an exploration of alternatives. Cronbach's alpha for the identity-achievement subscale are reported as .62 and .60, in this sample the alpha was .76. The identity-moratorium status subscale measures the strength of the commitment to choices and exploration of other suitable alternatives. Cronbach's alpha for the identity-moratorium status subscale are reported as .58 and .75, in this sample the alpha was .79. The identity-foreclosure subscale measures the strength of commitments to choices compared to exploration of alternatives. The Cronbach's alpha for the identity-foreclosure subscale are reported as .75 and .80, in this sample the alphawas .88. The identity-diffusion subscale measure the strength of the commitments to exploration of alternatives. Cronbach's alphas for the identity-diffusion subscale are reported as .62 and .64, in this sample the alpha was .73. The scoring of the EOMEIS is by summing individual subscale.

The U-MICS is a three factor identity model with a 5-point, 13-item Likert-scale questionnaire that elicit participants' responses ranging from 1 indicating "completely untrue for me" to 5 "completely true for me". The current sample's mean commitment, in-depth exploration, and reconsideration of commitment is as follows: 4.0 (SD= .88), 3.76 (SD= .82), and 2.03 (SD= 1.13). The Commitment subscale, 5 items, measures how committed they feel towards a specific outcome, in this case a friendship. The Cronbach's alpha for the commitment subscale has been reported to range from .82 and .89 (Crocetti, Schwartz, Fermani, & Meeus, 2010), in this sample the alpha was .92. The In-depth Exploration subscale, also 5 items, measures how much the individual has thought about their friendships. The Cronbach's alpha are reported between .72 and .84 (Crocetti et al., 2010), in this sample the alpha was .78. The Reconsideration of commitment, 3 items, measures the extent to which a person considers changing their commitments. The Cronbach's alpha are reported between .69 and .86 (Crocetti et al., 2010), in this sample the alpha was .88. The average score of each U-MICS subscale was used in data analyses.

3. RESULTS

Correlational analyses were used to examine the relations among the variables (see Table 2). The Exploration Subscale of the U-MICS conformed to expectations partially: Exploration was positively correlated with Achievement, and negatively correlated with Diffusion, but was not significantly related to Moratorium or Foreclosure. The Commitment Subscale of the U- MICS conformed to expectations well: Commitment was positively correlated with Achievement and Foreclosure and negatively correlated with Diffusion, but was not significantly related to Moratorium. The oddest findings were those for Reconsideration. Reconsideration should have shown a positive correlation to Achievement, and no relation to any other subscale. However, there was a negative relation between Achievement and Reconsideration, meaning that those with higher scores on Achievement were less likely to endorse the Reconsideration items. We did find a moderate positive correlation between Moratorium and Reconsideration and between Diffusion and Reconsideration, findings that go against expectations.

4. DISCUSSION

The U-MICS is only a 13-item measure, considerably shorter than the 64-item EOMEIS, and would be a very useful tool for inclusion in studies with a variety of measures. One important consideration for researchers is having questionnaires that are too long for the participants to complete before becoming tired of answering questions. The development of this very short identity measure was received with great optimism. It does do a reasonable job of approximating the diffused identity status. However, the approximating the other status groups is less than successful. None of the U-MICS scales conformed to expectation for the moratorium subscale, which would likely be the majority of a college student sample. It only barely captures the commitment of the Foreclosed status, but fails to show the lack of exploration involved in that status. While it does capture the commitment and exploration of the achieved identity, it does not capture the reconsideration that should be part of that status. The reconsideration scale seems to be a strange one, as both those in moratorium and those in diffusion seemed to endorse these items.

Our conclusion is that the U-MICS falls short of its promise and cannot be considered a shorter replacement for the EOMEIS. It seems clear the idea and measurement of the reconsideration of commitment scale needs further revision. One possibility is that the measure is too short. Another possibility is that the reconsideration items are poorly constructed or perhaps poorly conceived. Further development of the U-MICS is indicated.

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Characterization of Immune Responses During Tumor Progression Versus Spontaneous Engraftment Failure in a Novel Immunocompetent Double-Labeled Murine Melanoma Model

Binisha Karki[1], Natalie Fowlkes[2], and K.G. Kousoulas[3]
[1]52 Joe Iverstine Pl, Hammond LA 70401, Southeastern Louisiana University, binisha.karki@selu.edu
[2]Department of Pathobiological Sciences and Division of Biotechnology and Molecular Medicine, Louisiana State University, LA 70403, nwall1@lsu.edu
[3]139 David Boyd Hall, Department of Pathobiological Sciences and Division of Biotechnology and Molecular Medicine, Louisiana State University, LA 70403, vtgusk@lsu.edu

ABSTRACT

Melanoma is the sixth most common cancer and its incidence is increasing yearly. At least 13% of melanoma patients already show metastasis to regional or distant sites by the time they are diagnosed. Melanoma is known to be immunogenic cancer. Recently, significant advances have been achieved in developing immunotherapies for melanoma and other cancers. A novel approach to cancer treatment is the use of viruses (oncolytic virotherapy) to infect and kill cancer cells, as well as induce an anti-tumor immune response to known melanoma specific antigens such as MART-l/Melan-A, gpl00, gp75, and tyrosinase to eradicate metastatic tumors. A major hindrance to the development of immunotherapies for melanoma specific oncolytic virotherapy is lack of a predictable, immunocompetent melanoma model with clinical relevance. Lack of an appropriate model often results in partial and misleading preclinical data and ultimate failure in the clinics. Thus, there is an urgent need for the development of a robust preclinical melanoma model to test oncolytic viruses and elucidate important anti-tumor immune parameters that are involved in anti-tumor immune responses. Our laboratory recently developed such a model using B16-F10 murine melanoma cells which is double labeled with firefly luciferase and eGFP for dynamic in vivo monitoring of disease and fluorescent microscopy.

Key Words: Immunocompetent, Virotherapy, Melanoma

1. MODEL DEVELOPMENT

In this study, we observed that B16-F10 murine melanoma cells can be used to generate melanoma in C57BL/6 mice for studying melanoma in a murine model. For this purpose, we injected 6x10^5 cells in the left pinnae of each mouse. We observed each mouse systematically every 2 days for any sign of tumor development. Absolute tumor growth was detected was assessed through manual digital caliper method whereas tumor growth rate and metastasis by simultaneous detection of bioluminescent and fluorescent signals. Hematology, flow cytometry, and serology were carried out once weekly. Also, ELISA performed on serum facilitated in the evaluation of the antibodies against melanoma specific antigens and confirmed whether appropriate immune response can be induced in this mice model against melanoma. Necropsy, histopathology, and immunohistochemistry were performed at the termination of study to characterize the tumor microenvironment.

Our results showed that upon injection of B16F10 murine melanoma cells, C57BL/6 mice can develop tumor within two weeks. Despite the success of tumor development majority of the time, some rejections were observed as well. Our result indicated that although there was not much difference in the total lymphocytes count, B cell percentage was higher in mice that rejected tumor development. Also, both tumor success and failure groups had higher tumor specific antibodies compared to naïve control. Thus, this study suggested that B16-F10 cells can be used to develop tumor and generate adaptive immune response in mice model. Conclusively, this model can be used further to study virus mediated oncolysis and its possible outcome in anti-tumor immune response.

Multilevel Performance Evaluation of NVIDIA GRID VCA Using Iray and V-Ray Rendering Engines in 3DS Max Design

Cy Kipp[1], Kenneth A. Ritter III, Aaron D. Morgan, Charles E. Taylor, Terrence L. Chambers

[1]Mechanical Engineering Department, University of Louisiana at Lafayette, cy.kipp1@louisiana.edu

ABSTRACT

High performance computing is increasingly common in technological industries and there are many different solutions available on the market. Determining which computing solution is most effective can be difficult. This study investigated the performance analysis between a single-user, traditional high-performance workstation and a multi-user, virtualized workstation. Along with this direct performance comparison, it also discussed the potential impacts of virtualization on rendering performance, GPUs and the technological industry. Through the repeated rendering of two different Computer-Aided Design (CAD) models under varying test scenarios, a pool of data including render times and image quality was collected and analyzed. Two phenomena were observed and explained. One was a diminishing return in GPU power output that was observed after allocating four or more GPUs to a single rendering task. The second was a noticeable point of image-noise convergence during a render that could potentially be calculated and exploited to make rendering more time-efficient. These discoveries may impact the effectiveness of virtual GPU scalability and make time-consuming rendering more efficient for industry users.

Key Words: high performance computing, GPU virtualization, rendering

1. BACKGROUND

Companies like Metal Shark Boats based in Jeanerette, Louisiana, are constantly searching for innovative ways to optimize their technological performance. Metal Shark and many other companies using high performance computing for engineering and designing purposes are currently using traditional dedicated workstations for each of their many employees across multiple locations. While this system architecture is currently effective, it also presents several noticeable set-backs. (Brandon Francis, Director of IT at Metal Shark Boats, personal communication, October 18, 2017)

Traditional dedicated workstations restrict users to the capabilities of the hardware they contain internally and damper the productivity of the user by exhausting useful computing power on computationally expensive tasks like rendering an image. The NVIDIA GRID VCA is a network-attached appliance capable of hosting powerful virtual machines and streaming the display output to other devices on the network. As shown in Figure 1, this allows low-power devices (such as a laptop or tablet) to utilize the high-end hardware inside the VCA to complete resource-intensive processes far beyond the capabilities of the device's local hardware.

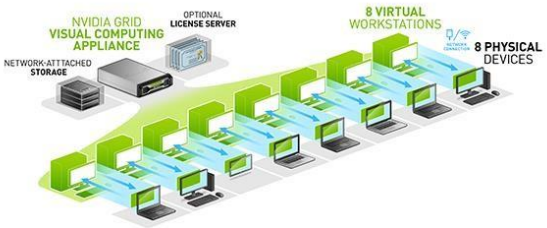

Figure 1: Nvidia GRID VCA virtual workstations [Raj, 2014].

The flexibility of the NVIDIA GRID VCA vGPU architecture allows for the allocation of more GPU processing power to users who need to perform these rigorous calculations and less to those who may only be using simple programs like Microsoft Office (Herrera, 2015). This creates a simple, scalable system that accommodates the varying needs of the users. Also, the varying needs of different users often calls for constant need for new hardware and IT maintenance that creates chaos for these company's IT departments (Brandon Francis, Director of IT at Metal Shark Boats, personal communication, October 18, 2017). The centralization of data in a VCA architecture eases this burden by allowing IT administrators to remotely control the capabilities of each virtual workstation and the data they receive which additionally increases data security.

As industry becomes more interested in virtualization options, questions about the performance of this system architecture become more important. This study conducts a direct comparison of the VCA to two other high performance rendering workstations and also assesses the effects of virtualization on GPUs and rendering.

2. EXPERIMENTAL METHOD

Three rendering workstations were used for the comparative analysis of this study. Each workstation used a different architecture designed to handle rendering of complex models. The specifications for each machine is presented in Table 1.

Table 1: Rendering workstations specifications.

Name	VCA	FP8100	Q5000
Graphics Card			
Graphics Card	NVIDIA GRID K2	AMD FirePro W8100	NVIDIA Quadro K5000
Vendor	NVIDIA Corporation	Advanced Micro Devices Inc.	NVidia Corporation
# of cards	8	2	2
SLI / CrossFire	Off	Off	Off
Memory per card	4,096 MB	8,192 MB	4,096 MB
Core clock	797 MHz	300 MHz	324 MHz
Memory bus clock	1,249 MHz	150 MHz	162 MHz
Driver name	NVIDIA GRID K2	AMD FirePro W8100 (FireGL V)	NVIDIA Quadro K5000
Driver version	9.18.13.4052	15.201.2401.0	10.18.13.6175
Processor			
Processor	2 X Intel Xeon E5-2670	2 X Intel Xeon E5-2630 v3	Intel Core i7-4960X
Reported stock core clock	2,600 MHz	2,400 MHz	3,600 MHz
Maximum turbo core clock	2,600 MHz	3,200 MHz	3,700 MHz
Physical / logical processors	2-/-16	2-/-32	1-/-12
# of cores	16	16	6
Package	LGA2011	FCLGA2011-3	LGA2011
Manufacturing process	32 nm	22 nm	22 nm
Power	1,475 W	85 W	130 W
General			
Operating system	64-bit Windows 7(6.1.7601)	64-bit Windows 7 (6.1.7601)	64-bit Windows 7 (6.1.7601)
Motherboard	4U rack mountable	Supermicro X10DAI	ASUS RAMPAGE IV BLACK EDITION
Memory	256 GB	64 GB	64 GB
Modules	unknown	4 x 16 GB Micron DDR4 @ 1,866 MHz	8 X 8 GB G.Skill DDR3 @ 1,334 MHz
Hard drive model	139 GB XENSRC PVDISK SCSI Disk Device	1,425 GB Intel Raid 5 Volume SCSI Disk Device	512 GB Samsung SSD 840 PRO Series ATA Device

As there was no software known to the researchers at the time of this study to adequately test the VCA performance, three separate 3D models were created and set as standards for comparison amongst the rendering engines used in this study. A simple model of a ball bearing was used for quick iterative rendering, a more complex ball bearing model was used to quickly compare rendering engines, and a computationally expensive model of a piece of engineering equipment known as the Green Machine™ was used to show more contrast between the rendering engines as shown in Figure 2. To render the models in 3ds Max Design, NVIDIA's Iray was used on the VCA and the Q5000, while V-Ray was used across all three workstations.

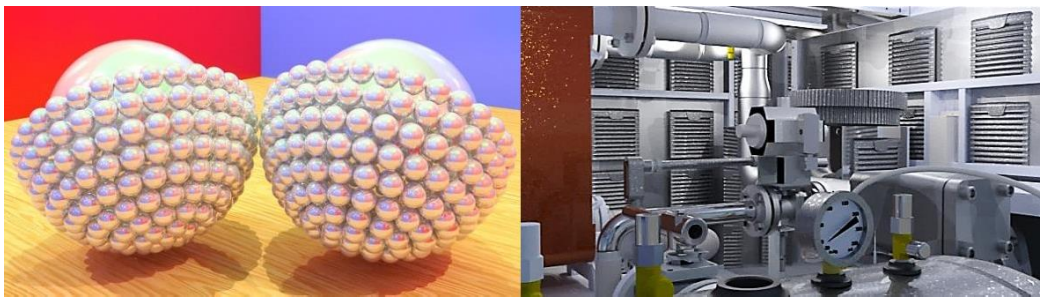

Figure 2: Iray rendered ball bearing model with 120 reflective spheres and 1.6 million polys (left) [Model credit: ADAMAX] and Internal Green Machine™ render with over 7 million polys (right).

3. RESULTS

3.1. GPU Scaling

Allocating additional GPUs on the VCA resulted in a decrease in total time required to produce a render of sufficient quality. The ball bearing model, shown in Figure 2, was rendered with the fixed amount of 1300 iterations on the VCA using 2, 4, 6, and 8 GPU allocations. All renders were generated using zero allocated CPU cores. As seen in Figure 3 on the left, there is a decrease in rendering time as more GPUs are allocated, but there appears to be a diminishing return after the allocation of four GPUs. More research must be done to discover the cause of this phenomena.

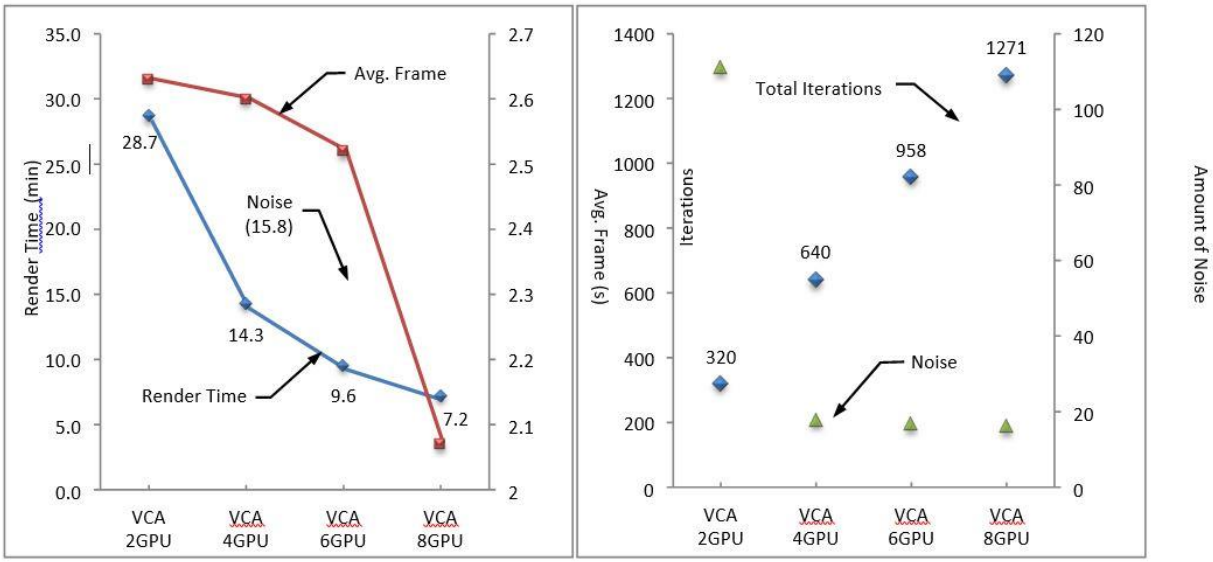

Figure 3: Ball bearing render in Iray with fixed iterations (on left) and fixed time (on right) on VCA with various GPU setting and Q5000 workstations.

Using a fixed time of seven minutes, the ball bearing model was rendered using the VCA at different GPU allocations and zero CPU cores. As shown in Figure 3 on the right, there is considerably more noise when using two GPUs, as the noise threshold was not reached. The iterations showed a near linear increase with more GPU resources, with an average of 160 iterations per GPU regardless of how many GPUs are used.

3.2. Hardware Comparison

In order to determine the time required for the workstations to produce a render of sufficient quality, the ball bearing and Green Machine™ models were rendered by incrementally increasing the render time until a satisfactory noise profile was created, as shown in Figure 4. One measure of image quality is the amount of noise in an image, and as shown, after a quick decline it converges to some value that is considered indicative of a sufficiently processed image. Noting this asymptotic point of sufficient image quality, reducing the amount of time spent rendering an image as it approaches this value can make the rendering process much more efficient.

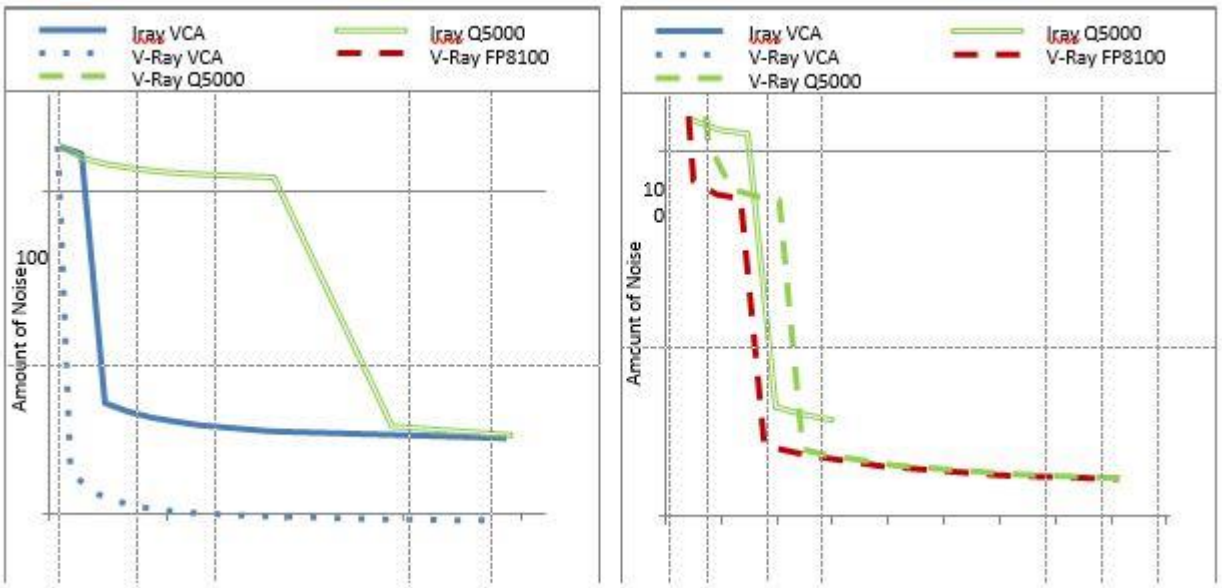

Figure 2: Image Quality Calculator results for ball bearing model (on left) and Green Machine™ model (on right).

4. CONCLUSION

To identify a solution for rendering animations of complex CAD models efficiently, this study performed an analysis of the unique GPU-focused architecture present in the NVIDIA GRID VCA and evaluated its performance relative to other high-end workstations. The data collected shows evidence of a diminishing return in GPU power when allocating additional GPUs to a single rendering task. This is indicative of a potential issue concerning the large-scale scalability of the GPUs in the VCA architecture. Additionally, it was discovered that as an image is rendered, after an initial rapid reduction of noise it slowly begins to approach an asymptotic value. Reducing the amount of time spent slowly approaching this asymptotic value can greatly improve the efficiency of the rendering process. Further investigation into these two phenomena may prove to be crucial to the industry's progression towards virtualization.

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Unease and Reengagement in Response to Abrupt Disruption of Conversational Flow

Lauren Lahaye[1], Ashley Hughes[2], Steven Stringfellow[3], Nicholas Barker[4], Mikaila Kinsland[5], Miranda Hebert[6], Maddison Knott[7], Julia Arceneaux[8], and Holy Monk[9]

[1]University of Louisiana at Lafayette, lll2159@louisiana.edu
[2]University of Louisiana at Lafayette, akh6663@louisiana.edu
[3]University of Louisiana at Lafayette, sxs4537@louisiana.edu
[4]University of Louisiana at Lafayette, neb3148@louisiana.edu
[5]University of Louisiana at Lafayette, c00295101@louisiana.edu
[6]University of Louisiana at Lafayette, rh4151@louisiana.edu
[7]University of Louisiana at Lafayette, c00203425@louisiana.edu
[8]University of Louisiana at Lafayette, jca0855@louisiana.edu
[9]University of Louisiana at Lafayette, jca0855@louisiana.edu

Hung-Chu Lin[1], Rick Perkins[2]

Psychology Department, Supervising Faculty
[1]University of Louisiana at Lafayette, hung-chu.lin@louisiana.edu
[2]University of Louisiana at Lafayette, rick.perkins@louisiana.edu

ABSTRACT

Delineating how people differentially respond to socially rejecting moments may bring forth insights on how personality dispositions underpin observed approach or avoidance strategies. Such insights carry implications for bolstering adaptive coping to unforeseen social encounters that potentially create the experience of being spurned by others. In a paradigm designed to elicit feelings of social rejection, college students' behavioral responses were examined in relation to their internal working models (IWM's—cognitive representations of the self and others) and general response propensity towards negative emotions (neuroticism) and embarrassability (susceptibility to experience of embarrassment). Before the social rejection scenario, participants filled out questionnaires, including the Relationship Scale Questionnaire, the IPIP Neuroticism Scale, and the Susceptibility to Embarrassment Scale assessing the IWM's, neuroticism, and embarrassability, respectively. Participants then were encountered by a male confederate of the experiment, who engaged the participant in conversation based upon a script. Towards the end of the script, the confederate abruptly cut off the conversation and engaged in behavior designed to be perceived as passively socially rejecting. Participants' behavioral responses were coded and categorized into four categories of behaviors: (1) unease, (2) reengagement, (3) disengagement, and (4) facial expressions suggestive of emotions. The findings revealed that, while college students exhibited behaviors indicative of awkwardness and disquiet when responding to a socially rejecting scenario, they also showed behaviors aiming at reengaging the confederate to resume back to the flow of interaction. For males, behaviors of unease appeared to be associated with more engaging actions, which, in a way, mirrored the finding that the greater propensity for embarrassment in males seemed to relate to fewer disengaging behaviors. Possible factors influencing differences between males and females in engaging and disengaging behaviors in a social context of perceived rejection will be discussed.

Key Words: Conversational flow, embarrassment, neuroticism, internal working models.

1. INTRODUCTION

Unexpected disruption of a conversational flow, even just a brief pause, can sometimes create a sense of unease. Just as smooth flow of conversation confers positive feelings of belonging, control, social validation, and perceived consensus (Haidt, Seder, & Kesebir, 2008), silences, particularly abrupt ones, threaten social needs and instigate feelings of rejection and negative affect (Koudenburg, postmes, & Gordijn, 2011, 2013; Zadro, Williams, & Richardson, 2004). When experiencing these socially threatening moments, individuals may exhibit behavioral responses (verbal or nonverbal) reflecting their negative internal states, of which the individuals may or may not be aware. The questions arise as to 1) how individuals differ in their behaviors in response to socially awkward disruptions of conversation flow, 2) how the response behaviors relate to individual differences in dispositional propensities for neuroticism, embarrassment, and internal working models of the self and others. The purpose of this study was to examine and describe the behavioral responses to disruption of a dyadic conversational flow using a paradigm designed to elicit feelings of social rejection. The observed behavioral responses were further examined for their associations with dispositional measures of neuroticism, embarassability, and working models of the self and others.

2. METHOD

2.1. Participants

The study included college students (27 females and 29 males, mean age = 20.2, *SD* = 3.5), who were recruited through the participant recruitment system of the Psychology Department at the University of Louisiana at Lafayette. Participation was voluntary, but participants were rewarded credits for partial fulfillment of research requirements.

2.2. Measures

Susceptibility to Embarrassment Scale (SES). The SES (Kelly & Jones, 1997) measures an individual's propensity for experiencing the emotion of embarrassment. Items capture one's propensity to feel emotionally exposed, vulnerable, and concerned about making mistakes in front of others. Participants respond to 25 statements on a 7 point Likert scale (1 = *not at all like me* to 7 = *very much like me*). According to Kelly and Jones, the items had internal reliabilities of .90, and a test–retest reliability of 0.50.

International Personality Item Pool- Neuroticism Inventory (IPIP-NIV). The IPIP-NIV (Costa & McCrae, 1992) measures an individual's inclination for neuroticism or emotional instability. Participants respond to 20 items by indicating the extent to which they agree with the statements on a 5 point Likert scale (1 = *not at all like me* to 5 = *very much like me*). The 20-item IPIP-NIV scale has the internal consistency of .91.

Relationship Scale Questionnaire (RSQ). The RSQ (Griffin & Bartholomew, 1994) measures an individual's internal working models of the self and others. Participants responded to 30 short statements on a 5 point Likert scale (1 = *not at all like me* to 5 = *very much like me*), tapping four prototypes of attachment—secure, fearful, preoccupied, and dismissing. Following Griffin and Bartholomew's procedure, the models of the self and others were derived from linear combinations of prototype ratings. The self model score (Self) is obtained by subtracting the

sum of fearful and preoccupied scores (both have negative self models) from the sum of secure and dismissing scores (both have positive self models). Similarly, the model of others (Others) is obtained from subtracting the sum of fearful and dismissing scores (both have negative models of others) from the sum of secure and preoccupied scores (both have positive models of others). Griffin and Bartholomew suggest that the positivity of the self model dimension may also be interpreted as a reverse measure of the anxiety dimension (attachment anxiety), and the positivity of the others model as a reverse measure of the avoidance dimension (attachment avoidance).

2.3. Procedure

When participants arrived at the laboratory, they first filled out a demographic information sheet and questionnaires, including the SES, IPIP-NIV, and the RSQ. Participants then were encountered by a male confederate of the experiment, who engaged the participant in conversation based upon a script. Towards the end of the script, the confederate started a scenario by engaging in behavior designed to be perceived as passively socially rejecting. He suddenly cut off the conversation, pulled out his cell phone and started browsing the internet, ignoring the participant for approximately 2 minutes. The acts of the confederate were designed to be perceived as passively socially rejecting. Participants' responses were videotaped and later played back for coding and analysis.

2.4. Coding and Analysis

Participants' response behaviors were coded into four categories: (1) engagement (e.g., leaning forward), (2) disengagement (e.g., looking away), (3) non-facial behaviors indicative of unease (e.g., finger biting), and (4) facial expressions suggestive of negative emotions (e.g., frowning). Each of the categories was coded by two coders who reached 100% of agreement on every code. Behaviors were tallied for duration (proportion of time spent in the entire social rejection scenario) and frequency (rate per minute).

3. RESULTS

For the associations between dispositional measures, females' attachment anxiety (negative self models) was positively related to neuroticism and susceptibility to embarrassment, $r = .74$, $p < .005$, and $r = .45$, $p < .05$, respectively. Likewise, males' attachment anxiety was correlated with neuroticism and embarrassability, $r = .49$, $p < .05$, and $r = .53$, $p < .005$, respectively. For both females and males, neuroticism and embarrassability were positively correlated, $r = .56$, $p < .0005$, and $r = .69$, $p < .0005$, respectively. For males, but not for females, attachment avoidance (negative views towards social others) was positively related to both neuroticism and embarrassability, $r = .40$, $p < .05$, and $r = .42$, $p < .05$, respectively.

There were no gender differences in both the duration and frequency of each the behavioral categories. Both frequency and duration of engagement behaviors were greater than those of disengagement behaviors, $t = 3.53$, $p < .005$, and $t = 3.53$, $p < .005$, respectively. In fact, college students spent 70 percent ($SE = 4.0$) of the entire social rejection scenario in re-engaging behaviors. Both frequency and duration of non-facial behaviors indicative of unease were greater than those of facial expressions indicative of negative emotions, $t = 2.65$, $p < .05$, and $t = 3.63$, $p < .0005$, respectively.

For males, but not females, frequencies of unease and engagement were positively related to each other ($r = .51$, $p = .005$). For both females and males, frequencies of

engagement and disengagement were positively correlated with each other, $r = .88$, $p < .0001$, and $r = .81$, $p < .0001$, respectively. Among the dispositional measures, the SES was related to frequency of disengagement but in different ways for females ($r = .44$, $p < .05$) and males ($r = -.45$, $p < .05$).

4. DISCUSSION

When responding to a social rejection scenario, college students exhibited behaviors indicative of awkwardness and disquiet. Interestingly, they revealed their unease more readily via the non-facial mode (e.g., rubbing fingers) than the facial mode (e.g., wrinkling the brow). Although they exhibited behaviors reflecting socially negative encounters, they showed significantly more behaviors aiming at reengaging the confederate to resume back to the conversational flow than those at disengaging from the uncomfortable situation. Particularly for males, behaviors of unease appeared to be associated with more engaging actions, which, in a way, mirrored the finding that the greater propensity for embarrassment in males seemed to relate to fewer disengaging behaviors. Possible factors influencing differences between males and females in engaging and disengaging behaviors in a social context of perceived rejection will be discussed. Delineating how people differentially respond to socially rejecting moments may bring forth insights on how personality dispositions underpin observed approach or avoidance strategies. Such insights carry implications for fostering adaptive coping to unforeseen social encounters that create the sense of social rejection.

In order to attain the consistency of experimental manipulation of the conversational flow across experimental sessions, the manipulation was conducted by only one male confederate throughout all the sessions. Considering that there might have been a gender effect of the confederate on the behaviors in response to the disruption of the conversational flow, the researchers are currently conducting a second phase of the study with a female confederate performing the manipulation of the dyadic interaction.

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The Effects of Auditory and Visual Stimuli on Physical Activity Participation among Children

Callie Lambert[1], Dr. Holly Kihm[2], and Patricia Sandoval[3]
[1]Southeastern Louisiana University, Box 10863, Hammond, LA 70448. Callie.lambert@selu.edu
[2]Southeastern Louisiana University, Box 10863, Hammond, LA 70448. Holly.kihm@selu.edu
[3]Southeastern Louisiana University, Box 10863, Hammond, LA 70448. Patricia.sandoval@selu.edu

ABSTRACT

The purpose of this study was to test the efficacy of auditory and visual stimuli on increasing the intensity of physical activity among school-aged children. There were small effects, whereby children engaged in higher intensity activity while listening to music on the treadmill vs. no music, whereas children engaged in lower intensity activity while cycling with a video vs. without a video, though no effects were statistically significantly different. Across all four exercise bouts, children reached vigorous intensity levels of physical activity.

1. METHODS

1.1 Participants

Nineteen children between the ages of 6 and 12 attending a nearby elementary school were recruited and enrolled into an after-school exercise program. Prior to engaging in study-related activities, staff members obtained written consent from parents and verbal informed assent from participants that were under the age of 10 years. Participants 10 years and over provided written informed assent. The study protocol, and all other study-related materials/handouts, were approved by the Southeastern Louisiana University and Pennington Biomedical Research Center Institutional Review Boards.

1.2 Instruments

Quantitative data collected for the two exercises performed were recorded on data sheets by the undergraduate students and then handed in to the lab graduate assistant at the end of each session. Each child's heart rate was tracked by the Polar GoFit Heart Rate monitors that the children wore while exercising. Exercise intensity was determined by recording the child's heart rate at the end of each exercise condition. Data were downloaded onto the Polar GoFit app, which was saved at the end of each lab. Total distance walked/jogged by each child or cycled by each child was recorded in miles.

1.3 Procedure

Program sessions were held in the Interactive Physical Activity Lab (I-PAL) for a total of 13 weeks. The I-PAL was equipped with various child size pieces of exercise equipment such as stationary bikes, pedal desks, treadmills, exergaming consoles and a tread-wall. Participants attended the program after school, with the option of attending up to three 2-hour sessions per week.

At each session, a different exercise activity was used to motivate and assess each participant's physical activity levels. Before commencing with the activity, each child's resting heart rate was recorded. These data were obtained by using Polar heart rate monitors.

The treadmill activity was performed during week four of lab with the aim of observing whether music could positively affect a participant's exercise performance. The activity consisted of four different bouts of exercise (3.0 mph, 4.5 mph, 3.0 mph, 4.5 mph) per round. Each participant completed two rounds of the activity. Each round consisted of a 1-minute warm up (pace of 3.0 mph), a 1-minute jog (pace of 4.5 mph), followed by a 2-minute walk (pace of 3.0 mph) and ending with a 1-minute jog (pace of 4.5 mph). At the end of reach round, the child's heart rate and total distance jogged/walked were recorded. A 1-minute water break was given between round 1 and 2. While all the rounds had a set speed, if a child decided to go slower than the assigned speed, or to stop before all rounds were completed, they could do so.

The stationary bicycle activity was performed during week five of lab. The aim of the exercise was to test if watching a video of a virtual bike path through Yellowstone National Park, while riding a stationary bike, had the ability to increase a child's physical activity level more than cycling without watching the video. This activity took part over the span of an entire week. On the first day, all children cycled for 10 minutes with the video projected on the screen at the front of the room. On the second day, all the children cycled for 10 minutes with no video. During each day, the bicycle resistance was kept at the lowest setting and children could pedal as fast or as slow as they desired. Children were encouraged to pedal for the entire 10 minutes, but if the child decided to stop before the time was up, he was not penalized.

1.4 Data Analysis

The primary outcome variable was % HR above rest during the exercise conditions. Secondary outcome variables included HR above rest, HR, and % HR_{max}, as well as distance travelled. The formula 208 – (0.7 * age) was used to calculate age-predicted maximal heart rate (HR_{max}), and vigorous intensity physical activity was classified as > 60% HR_{max} (Pescatello L.,2014).

Independent t tests were calculated to compare outcomes between condition for each modality (treadmill or cycling), and confirmatory paired sample t tests were calculated among the sub-set of children who completed both conditions. Cohen's d was calculated to estimate effect size.

2. RESULTS

In total, 19 children had complete data for the cycling activity (16 with video and 10 without video; 7 completed both conditions) and 14 children had complete data for the treadmill activity (11 with music and 13 without music; 10 completed both conditions). There was a small effect size between conditions (Cohen's d = 0.39) %HR above rest, though the difference was not statistically significant. There was no difference between conditions for the secondary outcomes of HR above rest, HR, % HR_{max}, or distance travelled. Effect size was small for HR above rest (Cohen's d = 0.19) and trivial for the others. Results were similar in the sub-set who completed both conditions based on paired sample t tests. Both treadmill conditions met criteria for vigorous intensity based on %HRmax (84% met vigorous intensity with music and 84% met vigorous intensity without music). All children met criteria for vigorous intensity physical activity when running on the treadmill with music, versus 91% when running on the treadmill without music.

There was a small effect between conditions in %HR above rest in the cycling activity (cycling without video vs. cycling with video; Cohen's d = 0.37), though there was no statistically significant difference. There was no difference between conditions for the secondary outcomes of HR above rest, HR, % HR_{max}, or distance travelled. Effect size was small for HR above rest (Cohen's d = 0.26) and trivial for the others. Results were similar in the sub-set who completed both conditions based on paired sample t tests. Seventy-one percent of participants reached their maximum heart rate while taking part in the cycling activity with video versus 66% of participants reached their maximum heart rate when cycling without the video.

3. DISCUSSION

The purpose of this study was to test the efficacy of auditory and visual stimuli on increasing the intensity of physical activity among school-aged children. There were small effects, whereby children engaged in higher intensity activity while listening to music on the treadmill vs. no music, whereas children engaged in lower intensity activity while cycling with a video vs. without a video, though no effects were statistically significantly different. Across all four exercise bouts, children reached vigorous intensity levels of physical activity.

There are few studies that have tested the motivational effects of auditory and visual stimuli on children. The results from the auditory trial support previous findings by Lee et al., (1987) and Waterhouse, Hudson, & Edwards (2010) in which upbeat music tempo positively influenced children's ability to exercise on the treadmill. However, it was surprising that the visual stimuli of the video produced a lower heart rate while children cycled; the subject and tempo of the video (cycling through a national park) may not be sufficiently stimulating to increase children's intensity. There is a need for more research to test under what circumstances can auditory and visual stimuli elicit improved exercise performance among children, including lengthening exercise bouts and increasing intensity of exercise, and if there are unintended negative effects as observed in the video condition of cycling. Given the Lee et al trial was performed over 20 years ago, future research should investigate incorporating new technology in PE classrooms such as music played on an iPhone while running, a fast-paced video played on a tablet while cycling, and exergames that use both auditory and visual stimuli in an engaging environment during structured exercise.

It is estimated that young people spend an estimated 7 hours and 38 minutes per day consuming different modes of media (Rideout, Foehr, & Roberts (2010). Much of that media usage is centered around listening to music (2 hours and 38 minutes) and playing video games (1 hour 13 minutes). By tapping into these two popular forms of media usage during physical activity bouts, children and adolescents may be more likely to engage in different modes of physical activity that would both grab their attention and potentially motivate them to work out at moderate-to-vigorous activity levels. Therefore, auditory and visual stimuli may contribute to creating successful exercise interventions in physical education classrooms. Early childhood experts believe that when used appropriately, technology and interactive media are two methods with which to support learning and physical development among children and adolescents.

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Recent Advances in the Synthesis of Organic Tellurium Compounds: Potential Building Blocks for Supramolecular Frameworks

Brent A. Larson[1], Jayna S. Patel[2] and Thomas Junk[3]
[1]Department of Chemistry, University of Louisiana at Lafayette, bal6995@louisiana.edu
[2]Department of Chemistry, University of Louisiana at Lafayette, jsp4586@louisiana.edu
[3]Department of Chemistry, University of Louisiana at Lafayette, txj9137@louisiana.edu

ABSTRACT

Several classes of organic compounds, which contain the rare element tellurium are known to undergo self-assembly to supramolecular frameworks, notably ribbons, chains and rings. These include the tellurazoles, which are highly stable to air, moisture and light. Supramolecular frameworks have potential applications ranging from catalysis and selective binding of metals to applied materials sciences. While tellurium is a congener of sulfur, the equivalent sulfur compounds lack the ability to self-assemble in this fashion. A major challenge standing in the way of applying organotellurium compounds is limited access. Thus, synthetic methods developed for the preparation of sulfur compounds cannot be directly adapted for the preparation of the tellurium analogs. Progress towards the development of synthesis of novel benzotellurazoles and their precursors is presented, as well limitations of these approaches. Novel compounds prepared in the course of our studies were characterized by X-ray crystallography, and their ability to undergo supramolecular self-assembly was determined.

Key Words: Tellurium, Supramolecular Framework, Tellurazole

1. INTRODUCTION

The self-assembly of supramolecular frameworks from organic compounds containing the rare element tellurium has seen considerable interest in the recent past. Notably, heterocyclic compounds including 1,3-tellurazoles, 2,5-telluradiazoles and 1,2-tellurazole-N-oxides are known to be capable of forming chains, ribbons and rings (Fig. 1).

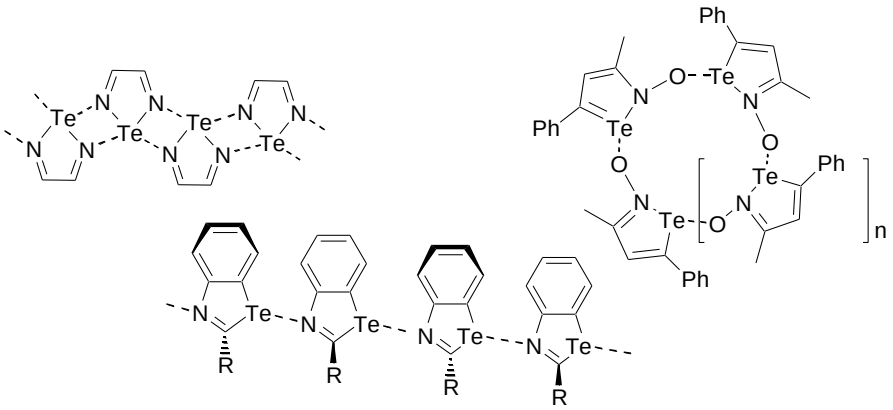
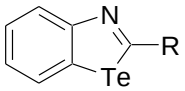


Fig. 1

Most prior work has targeted 2,5-telluradiazoles, which unfortunately have a high tendency to hydrolyze. Consequently, our work focuses on derivatives of 1,3-benzotellurazole, which are remarkably stable to light, heat and moisture.

2,5-telluradiazole



1,3-benzotellurazole

2. SYNTHESIS OF TARGET COMPOUNDS

The main challenge in the preparation of organic tellurium compounds is the fact that the synthesis of their sulfur congeners cannot be adapted to tellurium without major modifications. As a result, such compounds require the development of fundamentally new synthetic methods. One such method developed by us is the nucleophilic tellurination of 2-haloanilies, followed by oxidation of the resulting tellurolates to bis(2-aminophenyl) ditellurides (Fig. 2).

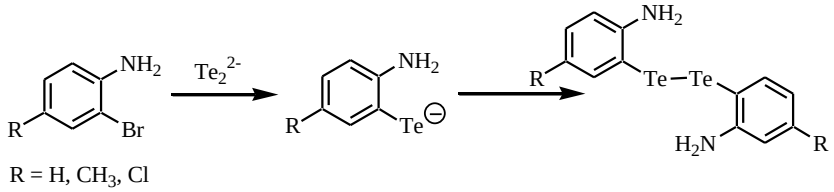


Fig. 2

This reaction is unique to tellurium and will not work for sulfur or selenium. It is limited by relatively harsh reaction conditions, including reaction temperatures in excess of 170˚. However, it did permit the synthesis of several tellurazoles *via* reductive ring closure, as exemplified for the synthesis of 2-cyanomethyl-1,3-benzotellurazole (Fig. 4).

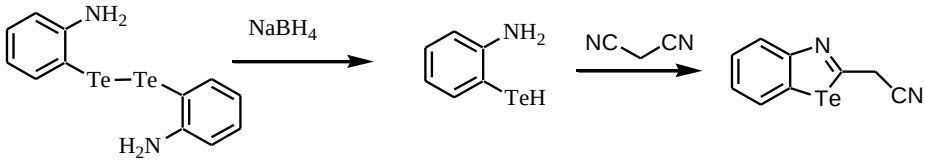


Fig. 4

A milder alternative would be the use of diazonium intermediates to introduce tellurium into an organic substrate. The feasibility of this approach was demonstrated with selenium, by reacting potassium selenocyanate with 2-nitrophenyldiazonium tetrafluoroborate as shown in Fig. 5.

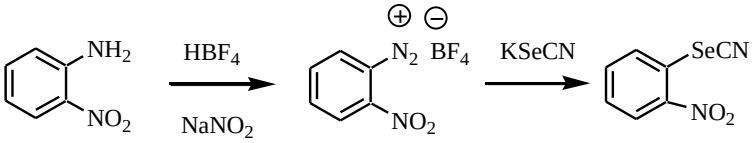


Fig. 5

An adaptation of this approach to tellurium proved challenging because potassium tellurocyanate is highly unstable in most media and diazonium salts are prone to rapid decomposition. We showed that a smooth reaction can be achieved when the telluracyanate anion is stabilized with a sterically demanding tetrabutylammonium counterion and acetonitrile is chosen as a solvent. However, the reaction product tends to disproportionate further to a bis(2-nitrophenyl) tellurium, a complication that is still under investigation (Fig. 6).

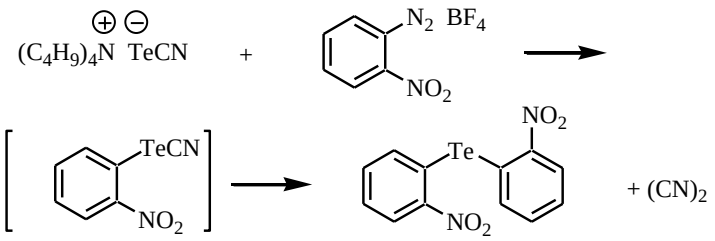


Fig. 6

All initial intermediates were converted to 2-aminobenzenetellurol by exhaustive reduction with excess sodium borohydride. Subsequent ring closure was achieved using malonitrile, isothiocyanates or acid halides (Fig. 7).

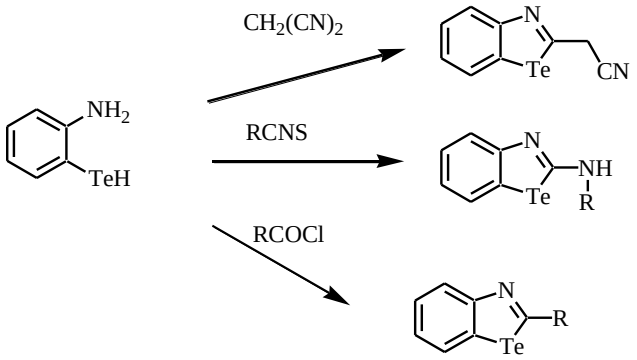


Fig. 7

3. RESULTS AND DISUSSION

Initial structural investigations of the products indicate that some 1,3-tellurazoles prefer to undergo dimerization while others do assemble to supramolecular products. Thus, an OPRTEP plot of the structure of 2-phenylamino-1,3-benzotellurazole, obtained by X-ray crystallography, indicates the formation of hydrogen bridged dimers rather than chains (Fig. 8, a bond-line structure showing a dimer unit is included for clarity)

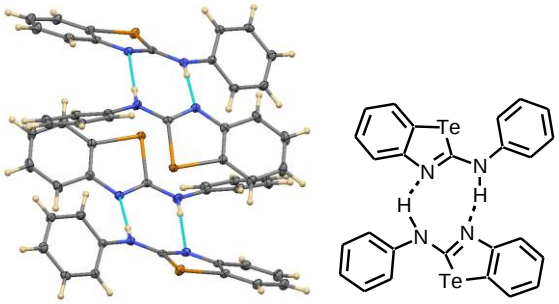


Fig. 8

In contrast, the ORTEP plot of 2-cyanomethyl-1,3-benzotellurazole indicates a pronounced ribbon structure as shown in Fig. 9, depicted next to an ORTEP plot of a single molecule of this compound. The ribbons result of a coordination of the nitrile nitrogens to tellurium in adjacent molecules.

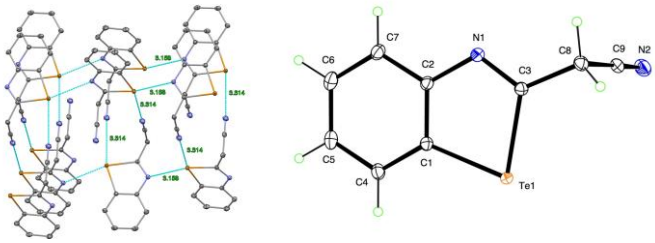


Fig. 9

With further work we plan to extend the range of benzotellurazoles that are synthetically accessible. It is obvious that the tendency of 1,3-tellurazoles to undergo self-assembly to supramolecular frameworks depends strongly on the nature of substitutents present in the molecules.

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Anxiety and Depression in College-Aged Population Who Have Experienced Parental Loyalty Conflict Behaviors

Taylor Mayer[1], Andrea Willey[2] and Monica Tauzin[3]
[1]225 Saint Landry Street Apt 2 Lafayette, LA 70508. University of Louisiana at Lafayette, mayertaylor@yahoo.com
[2]133 ½ Mildred St. Lafayette, LA 70506. University of Louisiana at Lafayette, willey.andrea@gmail.com
[3]323 Thibodeaux Drive, Lafayette, LA 70503. University of Louisiana at Lafayette, monica.tauzin@louisiana.edu

ABSTRACT

This study was an extension of Baker and Brassard (2013) and Baker and Eichler (2014) studies. These studies explored parental loyalty conflict behaviors experienced with adolescent males and college-aged population and how these were related to certain aspects of psychological abuse and mental health outcomes. Parental loyalty conflict behaviors are actions taken by parents that affect their child's relationship with, perception of and access to the other parent (Baker & Brassard, 2013). It was predicted that participants who reported higher levels of parental loyalty conflict behavior would report higher levels of depression and anxiety.

Two-hundred forty college students from a moderate-sized U.S. Southern university were recruited through the Psychology Department. Assessments were completed through Survey Monkey in a supervised lab setting. Participants completed the Baker Strategies Questionnaire (BSQ; Baker & Chambers, 2011), to measure the frequency of parental loyalty conflict behaviors and the Anxious/Depressed subscale of the Adult Self Report Scale (ASR; Achenbach & Rescorla, 2003). The BSQ is 20 items. 0 – 4 frequency scale for responses, (0 representing never and 4 representing always). The ASR is a 17-item scale measuring symptoms of depression and anxiety with possible responses of "not true", "sometimes or somewhat true", and "often or very true".

A Pearson's correlation assessed whether a positive relationship existed between BSQ scores and ASR Anxiety/Depression subscale scores. There was a moderate correlation between the two scores (r=.354, p<.01).

The potential outcomes of the triangulation that could occur when there are parental loyalty conflicts is of significant concern. Not only for the negative impact on the relationship between a parent and child, but for the mental health effects that could ensue for the child. The child could ultimately have a disintegrated relationship with a parent as well as anxiety and depression symptoms as young adults. These issues could trickle-down to other relationships and psychological functioning.

Key Words: anxiety, college, depression, parental loyalty conflicts.

1. INTRODUCTION

The actions and behaviors of parents impact their child's psychological well-being (Ben-Ami & Baker, 2012). Whether the actions are directed toward the other parent or towards the child, there has been evidence that a child can be affected in both positive and negative ways by

these behaviors. Davies, Martin, Sturge-Apple, Ripple, & Cicchetti (2016) showed children that had exposure to interparental conflicts predicted higher levels of internalizing and externalizing symptoms. Interparental conflict that triangulates a child is particularly harmful to their emotional adjustment (Verrocchio, Baker & Bernet, 2016). When the parents include the child in an adversarial situation, there are dysfunctional symptoms of having been terrorized, corrupted and isolated and these feelings can emerge as anxiety, depression and relationship issues (Baker & Eichler, 2014). As the child matures and moves on to more adult endeavors (i.e. college), the child has some emotional and psychical distance from the high stress, conflictual situation; there can be ramifications.

Parental loyalty conflicts (PLC) involve one parent interfering with the child's perception of, relationship with, or access to the other parent. Examples include bad-mouthing the other parent, asking the child to keep secrets from the other parent, or interfering with the child's communication or visits with the other parent (Baker & Brassard, 2013). PLC is seen in both intact and nonintact family structures. PLC is closely related to parental alienation. Parental alienation is a family dynamic where one parent engages in behaviors that could foster a child's unjustified rejection of the other parent (Baker & Eichler, 2014).

Baker & Brassard's (2013) study explored parental loyalty conflict behavior on adolescent males enrolled in a Jesuit Catholic high school. This study found exposure to parental loyalty conflicts for participants whose parents are in intact unions and nonintact relationships. Results revealed high rates of exposure to parental loyalty conflict-especially in divorced families. Further, boys exposed to loyalty conflicts reported significantly more negative experiences and behaviors, specifically maltreatment and depression. Although significantly higher in nonintact families, exposure to loyalty conflicts was surprisingly higher in the overall sample with 46% reporting some PLC exposure.

Interestingly, Wintre et al. (2011) explored depressive symptoms with a population of both males and females in their first year of university and found that females were more vulnerable to the effects of family dissolution than males when having to adjust to emerging adulthood.

Baker and Eichler (2016) utilized the Baker Strategies Questionnaire and found a relationship among parental loyalty conflicts, parental alienation strategies and various forms of abuse imposed on the retrospections of college-aged subjects. The current study extends the Baker and Eichler (2016) study and explores how PLC behaviors affect psychological well-being. Depression and anxiety were examined. It was predicted that subjects who reported higher levels of parental loyalty conflict behaviors would report higher levels of depression and anxiety.

2. METHODS

Participants were recruited through SONA, the University of Louisiana at Lafayette's online research participant program. Parental loyalty conflict behavior was measured using the Baker Strategies Questionnaire (BSQ; Baker & Chambers, 2011) and measures of anxiety/depression were conducted utilizing the Anxious/Depressed subscale for the Adult Self-Report (ASR; Achenbach & Rescorla, 2003). The BSQ is a 20-item 0-4 frequency scale, with 0 representing never and 4 representing alway. The ASR is a 17-item scale measuring symptoms of depression and anxiety with responses "not true", "sometimes or somewhat true", and "often or very true". Students completed the digital questionnaires and demographic questions on computers in the computer lab of Girard Hall at the University of Louisiana at Lafayette. Upon completion of the questionnaires, the participants were given a physical copy of the informed consent and debriefing form upon completion of the study. Participants were encouraged to

bring any concerns or emotional distress to the attention of the researchers or to access free counseling services if the experience of completing these assessments brought awareness of unfinished business.

3. RESULTS

Statistical analyses were completed with JMP 13 and IBM SPSS 2. Participant demographics are presented in Table 1. Table 2 compares the proportion endorsing loyalty conflict behaviors from Baker & Eichler (2014) and the current study. The "behaviors" are from the Baker Strategies Questionnaire (Baker & Chambers, 2011).

Table 1. Demographics of Participants

Gender		Age		Parental Union Status	
Female	173	Range	18-69	Intact	135
Male	63	Mean	20.2	Nontintact	100
Other	02	SD	6.2	Unidentified	05
Blank	02				

Table 2. Comparison of BSQ Endorsements between previous and current study

Proportion Endorsing the 20 Loyalty Conflict Behaviors according to the BSQ		
Behavior	**Baker & Eichler (2014)**	**Current Study (M&F)**
Made comments to me that fabricated or exaggerated the other parent's negative qualities while rarely saying anything positive about that parent.	63%	53%
Encouraged me to rely on his/her opinion and approval above all else.	48%	37%
Confided in me about "adult matters" that I probably should not have been told about (such as marital concerns or financial disputes) which led me to feel protective of him/her or angry at the other parent.	41%	34%
Created situations in which I felt obligated to show favoritism toward him/her and reject or rebuff/ignore the other parent.	29%	27%
Asked me to keep secrets from the other parent about things the other parent should have been informed about (e.g., upcoming plans, my whereabouts, etc.).	29%	26%
Created situations in which it was likely or expected that I choose him/her and reject the other parent.	25%	19%
Made it hard for me or made me feel bad about spending time with the other parent's extended family.	23%	14%
Encouraged me to disregard/think less of the other parent's rules, values and authority.	22%	18%
Became upset, cold or detached when I showed affection for or spoke positively about the other parent.	22%	19%
Limited or interfered with my contact with the other parent so that I spent less time with him/her than I was supposed to or could have.	21%	14%
Indicated discomfort/displeasure when I spoke/asked about or had pictures of the other parent.	21%	15%
Created situations in which it was likely that I would be angry with or hurt by the other parent.	20%	13%
Said things that indicated that the other parent was dangerous or unsafe.	19%	15%
Tried to turn me against the other parent.	16%	17%
Said and/or implied that the other parent did not really love me.	14%	9%
Asked me to spy on or secretly obtain information from or about the other parent and report back to him/her.	13%	12%
Made it difficult for me and the other parent to reach and communicate with each other.	12%	10%
Referred to his/her new spouse/partner as Mom/Dad and appeared to want me to do the same.	11%	10%
Referred to the other parent by his/her first name and appeared to want me to do the same.	10%	9%
Withheld or blocked phone messages, letters, cards, or gifts from the other parent meant for me.	6%	6%
Baker & Eichler Study N = 157		
Current Study N=480 (Mothers and Fathers scored separately)		

Table 3. Relationship between Parental Loyalty Conflict Endorsements and Anxiety/Depression

A Pearson's correlation assessed the relationship existed between BSQ scores and ASR Anxiety/Depression subscale scores. There was a moderate correlation between the two scores. (r=.354, p<.01). See Table 3 for results.

BSQ and ASR Anxious/Depressed Correlations			
		ASR/ Anxious/Depressed Total	BSQ TOTAL
ASR-Anxious/Depressed Total	Pearson Correlation	1	.354**
	Sig. (2-tailed)		.000
	N	240	240
**. Correlation is significant at the 0.01 level (2-tailed).			

The analysis shows that the depression/anxiety score from the Adult Self-Report were greater for participants who reported experiencing higher levels of parental loyalty conflicts from the Bakers Strategies Questionnaire.

4. DISCUSSION

It was predicted that subjects who reported higher levels of parental loyalty conflict behaviors would report higher levels of depression and anxiety. Results support the hypothesis. The Adult Self Report scores for depression/anxiety were greater for those participants who had reported experiencing higher levels of parental loyalty conflicts based on endorsements from the Baker Strategies Questionnaire. Adult well-being was reported to be unstable if young adults were exposed to parental conflict in the past (Verrochio & Baker, 2015). The mean age of the Verrochio & Baker study was 27.5, and was not isolated to college students. The current study focuses on the college-age population and incidences of depression and anxiety.

Ben-Ami and Baker (2012) found that adults who had experienced parental alienation were more likely to experience major depressive disorder. The current finding is important in that it supports the idea that experiencing parental loyalty conflicts are related to experiencing symptoms of anxiety and depression, as has been found for broader interparental conflicts and child symptoms (Elam, Sandler, Wolchik, & Tein, 2016; Rowe, Zimmer-Gelbeck, & Hood, 2016). Sarrazin and Cyr (2007) discuss many of the negative effects of severe parental conflicts. These conflicts can include those of parental loyalty conflicts. Clients who report growing up

witnessing significant interparental conflicts should be screened for experiences of parental loyalty conflicts. This is salient because parental loyalty conflicts involves triangulation of the child and child guilt for being a source of conflicts, which are both risk factors for psychological maladjustment.

The potential outcomes of triangulation that could occur when there are PLC behaviors is of dire concern. Not just for the relationship between a parent and child (when the child is plied into the PLC behaviors by the other parent), but for the mental health affects that could ensue for the child. The child might ultimately have a disintegrated relationship with a parent and feel a lot of guilt and shame for these behaviors supported by the PLC-activating parent. Adults who had experienced parental loyalty conflicts, such as parental alienation, were more likely to experience major depressive disorder (Ben-Ami and Baker, 2012). This research supports the research of the effects of triangulation and distress that ensues when parents promotes loyalty conflicts and how a child's psychological well-being is at risk when this happens.

5. IMPLICATIONS

This research supports the importance of mandated parent-training for those cases where significant parental loyalty conflicts are being experienced by children. Children growing up in this environment are at risk of experiencing symptoms of depression and anxiety throughout their lives.. Clinicians should work with children to help them recognize the unhealthy behaviors their parents are partaking in and develop skills to combat the urge to turn against one parent (Baker & Ami, 2012).

The risks for depression and anxiety, as well as relationship problems, are evident from multiple converging lines of research: emotional security theory based approaches (Rowe et al., 2016), parental loyalty conflicts (e.g., Baker & Eichler, 2014), and parent-training programming for non-intact families (Wolchik, Schenck, & Sandler, 2009). Salem, Sandler, & Wolchik (2013) report that 46 states in the nation offer parent-education of some sort to separating and divorcing parents. However, interest in and utilization of these types of intervention programs are noted to be flagging systemically.

Future research could explore the need for clearer classifications of the intactness of a family unit as this current study revealed the difficulty that the subjects had defining their own family structure. This phenomenon could be frustrating and stress-inducing in and of itself.

This study limited the scope to Southern college-aged population to explore how subjects are affected by family issues with psychical distance. It was a retrospective, self-report. With this in consideration, it might be of value to explore other adult populations with the same measurements and considerations.

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Examining the Construct of Time-On-Task in an iPad Assisted Reading Intervention for At-Risk Students

Brooke Mazac
111 Nottoway Drive Houma, Louisiana 70360
Nicholls State University, bmazac@its.nicholls.edu

ABSTRACT

With the rapid technological advancements of the new millennium, individuals are finding that technology is finding its place in every aspect of human life. Education, of course, is no exception. According to the National Center for Education Statistics (IES, 2010), 97 percent of teachers had access to at least one computer in their classroom on a daily basis, with 93 percent having Internet access to those computers. Other options for technology in the classroom, such as interactive whiteboards, tablets, digital cameras, projectors, and printers have aided in revolutionizing the world of education (Robinson, McKenna & Conradi, 2012). The use of Apple's iPad specifically in an educational setting has been explored and studied more in recent years, and has been proven to increase levels of academic achievement, student enjoyment, and pupil engagement (McClanahan, Williams, Kennedy, & Tate, 2015; Schaff, 2012; Arthanat, Curtin, & Knotak, 2013).

As undergraduates in the College of Education at Nicholls State University, pre-service teacher candidates are trained in multiple courses how to provide instruction and intervention using iPads. This study will focus not on academic achievement or advancement, but a quantitative measure of time-on-task. Time-on-task refers to the fact that students should be engaged in the assigned task during the designated time period (Berliner, 1990).

In the study, time-on-task was measured using a method of observation and recording called momentary time sampling (Spanjers, Burns, & Wagner, 2008). The results were calculated to show percentage of time-on-task for each intervention method, and designed to show an increase in student time-on-task and the use of the iPad in reading intervention.

Key Words: Education, Technology, Reading, Intervention

1. METHODOLOGY

The purpose of the study is to evaluate the relationship between of the presence of the iPad in reading intervention and student time-on-task. Time-on-task is measured using momentary time sampling, modeled on the methodology of studies of time-on-task by Spanjers, Burns, & Wagner (2008) as well as by Larabee, Burns, & Mccomas (2014), and special observation recording sheets were created for this study inspired by the informational guide by Teighi-Bennet et al., 2003). During intervention, momentary time sampling sheets would be completed to document time-on-task. This would be recorded three times with the iPad as an intervention tool, and three times using traditional intervention materials. These momentary time sampling sheets can be used to calculate the percentage of time a student spends on task when exposed to either type of intervention. This can be done by counting the number of check marks in boxes on the form, indicating an instant that a student was recorded to be on task, and dividing that number by the total number of boxes with marks in them. The quotient will give you the percentage of time during the intervention that the student spent on task. The hypothesis of this

study is that students will show increased percentage of time-on-task when intervention is facilitated through the iPad.

The participants in this study were teacher education candidates and local elementary school students who had been identified by their teachers to be at-risk for reading deficiencies. The teacher educations candidates were enrolled at Nicholls State University located in Thibodaux, Louisiana. The students participating in the study were from local elementary schools, and ranged from first to fifth grade.

Teacher education candidates enrolled in Education 402: Reading Instruction in Elementary School and were each issued an Apple iPad. Each candidate signed a Nicholls State University user agreement stating that the iPad would be returned at the end of the semester in the same condition in which they received it. The iPad came preloaded with carefully selected literacy applications, and the candidates received a list of the applications as well as descriptions of them. The candidates enrolled in Education 402 were assigned a local K-5 student who was identified as at-risk in reading. Once the candidate was paired with the student, they administered the Quantitative Reading Inventory V (QRI-5) pre-test. The results of the pre-test revealed to the candidate the strengths and weaknesses of the student, and helped them determine where to begin with intervention. Candidates selected iPad apps that would benefit the student the most.

The candidates were instructed to use the iPad and at least ten times throughout their semester of intervention. The candidates had the freedom to decide when they used the iPad versus traditional methods of intervention. The candidates were also instructed to record student time-on-task during their intervention six times. Three times must be done during an intervention session using the iPad, while three times must be done without the use of technology. For each time, the candidate used a momentary time sampling chart prepared specifically for this study. The candidates were instructed on exactly how to use the charts for recording time-on-task. The candidates were also given detailed descriptions of what constitutes as on task and off task behavior. On task behavior includes actively reading or decoding words, participating in conversation, writing, using manipulatives correctly, or anything other behavior in which they are attentive and participating in their assigned task. Off task behavior included discussing things unrelated to the intervention, inappropriately playing with the manipulatives, putting their head down, failure to participate, or being inattentive to the interventionist, as in the study by Larabee, Burns, & Mccomas (2014). The intervention session was split into one minute intervals, due to the fact that Gunter, Venn, Patrick, Miller, & Kelly (2003) indicated smaller intervals of one to two minutes being more accurate when recording time-on-task. At the end of every interval, the candidate would look at the student and document their behavior as being either on task or off task. The candidate recorded all six trials on their momentary time sampling sheet.

2. RESULTS

The purpose of this study was to determine the effect that implementation of iPad assisted reading intervention had on the amount of time a student spent on-task. The hypothesis was that by comparing the percentage of time-on-task both with and without the use of the iPad in intervention, the amount of time a student spent on task would be greater during trials in which the iPad was used. This hypothesis was confirmed, as the results demonstrated five out of six trials had increased time-on-task when iPads were implemented. Further, there was an average increase of 9% in percentage of time-on-task when the iPad was used.

Despite its best efforts, this study does have quite a few limitations. First, the sample size would need to be much larger in order to produce more reliable results. As this study only

had six sets of data, the information may not be representative of a diverse sample group. Another limitation is that some the recordings of time-on-task vary in length, so that in some cases, intervention as short as five minutes was recorded. Intervention lasting such a brief time may be difficult to keep a student on task for in general, so intervention times for recording purposes should be set to a minimum of at least ten minutes. A third limitation to the study is that due to the fact that the candidate is facilitating the intervention and recording time-on-task they may not be able to get the most representative recording of time-on-task. The results of this study are consistent with many others that suggest that iPads as an instructional tool provide many benefits in the classroom (Benton, 2012; Clements & Samara, 2003; Larabee, Burns, and Mccomas, 2014). A much of the literature suggests, professional training, development, and support for teachers using new technologies in the classroom is a pivotal element to their successful integration into the curriculum.

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The Role of Parent Involvement and Supervision and the Prediction of College Success

Kristine Melancon[1], Audra P. Jensen, M.S.[2], and Valanne L. MacGyvers, Ph.D.[3]

[1]Department of Psychology, University of Louisiana at Lafayette, klm5376@louisiana.edu
[2]Department of Psychology, Northern Illinois University, apj1253@hotmail.com
[3]Department of Psychology, University of Louisiana at Lafayette, macgyvers@louisiana.edu

ABSTRACT

Successful college students are often successful because of the role their parents have played in their lives. Successful college students typically have high grades, and good leadership and followership skills. In this study, retrospective self-report of perceived parental involvement and supervision were used to predict collegiate success, as indicated by self-reported grade point average, and scores on a measure of Leadership and Followership skills. Results indicate that perceived parental involvement was a significant predictor of GPA, and Followership skills. Perceived parental supervision was also a predictor of GPA, and of Leadership skills.

1. BACKGROUND

Developmental psychologist, Diana Baumrind, studied parenting behaviors in the 1960's and concluded that there were distinctive parenting styles: authoritative, authoritarian, and permissive (Baumrind, 1966, 1996). Other researchers identified a fourth style, the uninvolved parent. Key in determining parenting styles are the dimensions of Parental Control (or as we labeled it Parental Supervision) and Parental Support (which we labeled Parental Involvement). Authoritative parenting consists of parents who supervise and are more involved in their children's lives by demonstrating firm and encouraging methods of teaching as well as explaining themselves. Authoritarian parents who do not explain themselves and use more forceful tactics ("do this because I said so") emphasize conformity. Although both parenting styles are effective in creating children who succeed, authoritative is considered to be better because it teaches the child to be autonomous as well as to have high self-esteem and learn to be self-reliant (Steinberg, Lamborn, Dornbusch, & Darling, 1992). The permissive style offers support but no parental control and is not associated with positive outcomes.

Educational research has long found that Parental Involvement is a strong predictor of academic success, beginning in preschool and continuing through high school (Sebastian, Moon, & Cunningham, 2017). The more parents monitor and insist on their children learning, the better the children do in school. Do these effects continue into college is the question. We hypothesized that students whose parents were more involved and offered close supervision their children will have higher GPAs. Further, we expect that these parenting behaviors will also be related to both student leadership skills and student followership skills.

2. METHODS

A sample of 210 University undergraduates who were participating for course credit (males = 55; Females = 151, Unspecified = 3) completed a survey presented on Survey Monkey. From the IPIP database, we adapted ten items assessing leadership and twelve items that assessed followership. Factor analyses and internal consistency analyses were satisfactory (Cronbach's

alpha for Leadership = .81; for Followership = .85). Using the parenting style measure developed in the Steinberg labs at Temple University, students responded to five items of father involvement, five items of mother involvement and another four items of "parental" involvement (not specified by gender). Students also responded to eight items assessing the degree of supervision they received (Steinberg, Lamborn, Dornbusch, & Darling, 1992). The parenting measure was a retrospective measure asking students to recall parental involvement and supervision during their early and middle adolescent years (ages 13-17), as opposed to current parental behavior. Students self-reported their grade point average. The survey asked students to report their GPA as given on "Banner," the University's Student Information System for Higher Education. Most students simply opened another browser window and looked the number up, often reporting the GPA to three decimal places.

3. RESULTS

Regression analyses were used to analyze the data. In the first set of analyses, we regressed parental supervision and parental involvement on reported GPA. We found that Parental Involvement prior to college significantly predicted college GPA, F (1, 199) = 10.32, p <.01. Students who perceived their parents to be more involved in their lives in early and middle adolescence had higher grades in college. We did not find a main effect of Parental Supervision on Grades, but Parental Supervision did moderate the impact of Parental Involvement. In a multiple regression analysis, we regressed the Parental Involvement and Parental Supervision as main effects, as well as the interaction of Involvement and Supervision on to GPA. Again, we found the strong main effect of Parental Involvement, GPA, F (1, 194) = 7.65, p <.01. We also found a significant interaction between Parental Involvement and Supervision in predicting GPA, F (1, 194) = 6.31, p <.01.). This main effect of Parental Involvement is moderated by Parental Supervision such that those parents showing a more Authoritative Style of high support and high supervision had college students with higher GPAs.

Parental Supervision was regressed on Leadership Scores, F (1,189) = 4.46 p <.05). Students who reported their parents as being stricter in their supervision during early and middle adolescence showed stronger leadership scores in college. No other significant predictors of leadership were found.

Parental Supervision was also regressed on to Followership Scores and found to be a significant and positive predictor of Followership, F (1,198) = 18.37, p < .01. In examining the role of Parental Involvement, we found that only Maternal involvement (five items) was related to the Followership scores, F (2, 196) = 5.62, p < .01. Further examination of the relative importance of Supervision and Maternal involvement revealed that when both Parental Supervision and Maternal Involvement were in the model, only Supervision predicted the Followership skills, F (3, 195) = 14.49, p < .01, while Maternal Involvement became non-significant, F (3, 195) = 0.44, *ns*. Thus, it is the degree of parental supervision that really predicts the college students' Followership skills.

DISCUSSION

The results of this study again highlight the importance of parents adopting an Authoritative Style of parenting in order to promote positive outcomes from their children. These data show that the effect lasts well beyond childhood and is a significant predictor of collegiate success. It is not surprising that parental involvement is related to academic success in college; this variable has been known to be the single most powerful predictor of student achievement beginning in preschool (Park, & Holloway, 2017; Sebastian, Moon, & Cunningham, 2017). To see that the effect carries into college is not surprising, but might be considered satisfying.

However, the real news in this study is that parental supervision helps to create young adults who are more skilled leaders and more skilled followers. It is not surprising that growing up with rules and guidance helps children learn how to guide others and to follow others. It makes logical sense that children can learn these skills from their parents who are modelling them. However, these are new findings and add to the literature in the development of leadership skills.

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Friction Stir Reverse Extrusion: A Study of Processes and Grain Structure

Austin M Menard[1], Dr. William J. Emblom[2]
[1]3314 Schwing Rd, New Iberia La, 70560, Undergraduate Research Student, University of Louisiana Lafayette, amm7277@louisiana.edu
[2]CLR 119B, Lafayette La, Instructor, Mechanical Engineering, University of Louisiana Lafayette, wje2777@louisiana.edu

ABSTRACT

Friction stir reverse extrusion, FSRE, is a method of tube forming that involves pushing a rotating a probe into a solid, cylinder shaped piece of material. Rather than cutting into a solid piece of material to form a tube, this process uses friction to heat the material, then pushes a probe into the heated material. The material then forms around the rotating probe creating a tube. The FSRE process is relatively new study has not yet entered any production or commercialization phases. This study focuses on minimizing the wall thickness of FSRE produced tubes by studying the mechanical processes. This study also focuses on the resulting grain structure of FSRE produced tubes.

1. FRICTION STIR REVERSE EXTRUSION PROCESSES

1.1 Procedure

Because of the relatively recent conception of FSRE, no process has yet been determined as the standard over any other process. Therefore, determining a process that can efficiently and safely produce tubes using the FSRE process is paramount. In this study, a two-piece die system is used. This system clamps the material in place, allowing the rotating probe to enter the die and penetrate the material. As the probe enters the material, the tube is extruded upwards in the die. Figure 1 shows a split open view of the die with a 1 inch sample of material placed in the tube cavity.

Figure 3: Split open die with material placed in cavity

This die is then placed into the clamp of a milling machine, and the probe inserted into the chuck of the machine. To assist with alignment, a brass bushing is placed over the die, positioning the probe concentric to the center of the material. This ensures an even wall thickness around the cross section of the tube. Figure 2 shows the die, closed and aligned with the probe.

Figure 4: Closed die aligned with probe in milling machine

1.2 Minimizing Wall thickness

The primary goal of this study is to minimize the wall thickness of the tubes produced by FSRE. At this time, only one die is available for testing, therefore the outer diameter of the tube is constant, it cannot be minimized to decrease wall thickness. Consequently, the only method of creating a thinner wall is by increasing probe diameter. However, enlarging the probe requires an increase in downward force required as well as increases the amount of friction in the system. Therefore, the probe's rotational velocity must be carefully chosen to help maximize the frictional effects of the probe while maintaining adequate power to complete the FSRE process. This can be problematic as the rotational velocity and power produced are inversely proportional. As the rotational velocity increases, the power of the probe to penetrate the workpiece decreases. Figure 3 shows the result of insufficient power during the FSRE process, causing the probe to stop, and lodge itself into the material. Through multiple test a preferable

rotational velocity has been found at 2000 revolutions per minute. Figure 4 shows an extruded tube inside of the closed die.

Figure 3: Probe jammed into workpiece due to insufficient power during the process

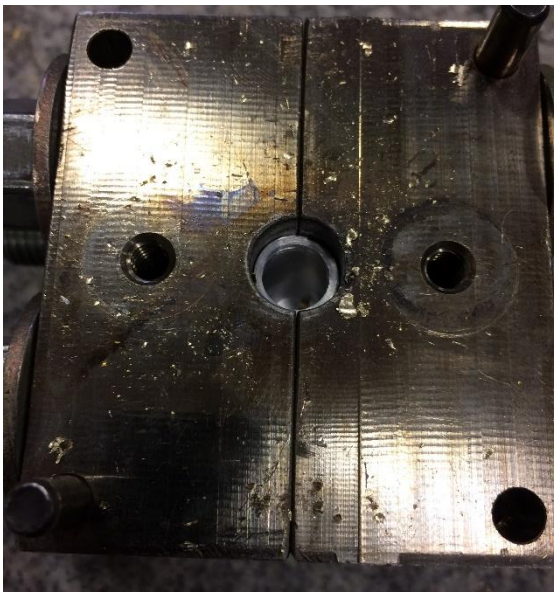

Figure 4: Successfully extruded tube still in die, Wall thickness is visible from top

2. RESULTING GRAIN STRUCTURE

The grain structure resulting from the FSRE process is unique to those form from conventional methods. One major difference, is that tubes produced using this process do not have seams. Therefore, the grain structure remains uniform around the entire cross section of the tube. The resulting grain structure is also highly refined during this process, meaning the grains are more tightly compacted, creating a stronger tube. This refined grain structure could also reduce frictional effects of fluids flowing inside of them as well as retain heat better. During this study, it is planned to analyze the grain structure of the tubes produced using the above processes.

3. POTENTIAL IMPACT

By studying this tube forming method at the experimental level, it is possible that this process can be implemented into creating much larger tubes. The refined grain structure has many potential positive influences in comparison to traditionally produced tubes. On a larger scale, reduced friction losses on fluids due to the refined grain structure can significantly reduce losses on piping systems over extended lengths. Heat retention will also be greater, requiring less insulation around tubes emphasized on maintaining temperature. The refined grain structure can also effect the overall strength of the tube. While these traits are noticeable at the experimental level, it can only be assumed at this point that taking this process to a larger scale will also increase the traits shown. This study is done with the hopes that the information gathered during it will aid in potentially larger scale study's and eventually into production or commercialization of FSRE processed tubes.

Attitudes Toward Mental Health Care and Mass Shootings

Jourdan L. Monfrey[1]
[1]211 Liberty Ave Apt 233 Lafayette, LA 70508, The University of Louisiana at Lafayette, jxm8667@louisiana.edu

ABSTRACT

This project was conducted for a class assignment previously and is currently being re-written with new, more rigorous collection methods. The study examines the attitudes towards a possible relationship between mental health care and mass shootings in order to better understand the way the public perceives this relationship. The updated study explores perception through the lenses of race and religion to investigate possible differences. The data were collected via an online survey distributed to students in introductory psychology and criminal justice classes during the fall of 2017. Preliminary results from the original study suggested that the majority of respondents recognized the relationship between mental health and crime, but were slightly less likely to agree on a relationship between mental health and mass shootings. Additionally, when asked about specific mass shooting incidents, respondents were varied in placing blame on lack of mental health resources. The updated research study includes demographic questions about race and religion in order to theorize about differences in attitudes that exist among certain groups.

Key words: mental health, mass shootings

1. INTRODUCTION

The National Alliance on Mental Illness (NAMI) found that 43.8 million adults in the United States experience a type of mental illness in any given year (National Alliance on Mental Illness, 2017). Out of those, about 25 percent live with a severe mental illness, such as schizophrenia, schizoaffective disorder, or posttraumatic stress disorder (National Alliance on Mental Illness, 2017). Although mental illnesses such as schizophrenia are rare and range in severity, the individuals who experience these disorders often require comprehensive medical and mental health attention. In 2008,13.4 percent of adults in the United States received treatment for various mental disorders and/or illnesses. However, even as mental health issues have risen, the U.S. has experienced major budget cuts to the mental health care system since 2009 (National Alliance on Mental Illness, 2011).

From 2009 to 2012, 4.35 billion dollars in funds were cut from various mental health agencies across the United States (Satlin, 2012). These cuts affected numerous facilities and mental health care programs, both inpatient and outpatient, across the nation. Rapidly increasing gaps in mental health resources left many people without the proper care they were once given and, additionally, has prevented others from receiving adequate care as well. This has resulted, in some extreme cases, in life threatening outcomes. Because of the budget cuts being made, many who should seek proper treatment, or assessment, cannot.

Another agency affected by budget cuts has been the National Instant Criminal Background Check System (NICS). This background check system is used when determining whether an individual is eligible to purchase a firearm of any type (Cooper, 2013, para. 6). Without proper funding, only limited information is available to this system, jeopardizing the

NICS's ability to ensure only qualified individuals can make purchases (Cooper, 2013, para. 6). However, even a perfectly funded NICS may not be of value if the individuals purchasing arms have never been convicted of a criminal act and/or had the extent of their mental illness judged in court.

James Holmes, Dylan Roof, Adam Lanza, Omar Mateen, and Stephen Paddock are a few individuals who have taken the lives of countless people since 2009. These men allegedly suffered from severe mental issues, yet somehow failed to seek or receive proper treatment, and apparently escaped detection of those who might have assisted with their mental health issues. The Washington Post reported that, in only four out of forty-three shootings was there evidence that an individual raised concerns about the mental stability of the shooter before the attacks had taken place. These individuals also notified authorities beforehand (Plumber, 2013, para. 6).

This paper will summarize mental health care budget cuts and the effects on mental health facilities, and discuss the possibility that past mass shootings might be related to the financial cuts made to mental health resources. Because taxpayers are ultimately the source of approval and disapproval for budgeting issues, a survey will be distributed to determine attitudes and opinions toward a possible relationship between mental illness and mass shooting incidents.

2. METHODS

Participants in this study consisted of undergraduate students enrolled in introductory psychology and criminal justice classes at a southern university. All participants were at least eighteen years old. After receiving IRB approval, a link to the survey was provided to the psychology and criminal justice instructors who agreed to allow their students to participate.

The opening page of the online survey delivered informed consent that also included the information that this was a voluntary and anonymous survey, that the participants could refuse or quit the survey at any time, and the way to contact the researcher. The survey included seven demographic questions about age, ethnicity, religious and political affiliation, major, and year of academic classification. The second half of the survey focused on the respondent's opinions about mental health and its possible relationship with mass shootings that have taken place within the past six years by presenting a vignette such as the following:

> Steven K. Huprich, a personality assessment psychologist, used his knowledge on personality assessment to evaluate the Orlando shooting that took place on June 12, 2016. Omar Mateen, the shooter, went into Pulse Nightclub and killed forty nine people out of hatred for their lifestyles. Huprich stated that if Mateen would have been examined, he would have suggested that he could have suffered from paranoid personality disorder which could have encouraged his actions.
>
> To what extent do you believe that if Omar Mateen had received proper psychological treatment, he would not have killed forty nine people at the Pulse Nightclub?

Answers included a Likert scale consisting of the choices strongly disagree, disagree, neutral, agree, or strongly agree. The remainder of survey items asked about agreement on the relationship between lack of mental health resources and crime in the U.S. The survey was open for seven days.

3. RESULTS

The preliminary results found that while majority of the participants (over 60%) in this study were not aware of the budget cuts made to the mental health care facilities in the United States, they were very vocal about their opinions toward mental health care and crime related topics. The

participants were given five answer choices to choose from and told to mark all that applied. These choices were to see how they viewed criminal behavior. Majority of the participants believed that criminal behavior could be controlled with proper guidance, a person will commit a crime no matter what, and also that mental illness is a factor in whether a person will commit a crime or not. A major factor that was analyzed in this study was whether the participants believed religion has anything to do with the importance of seeking treatment. 45% of the participants believed that religion is a factor in whether a person will seek treatment or not. Another 28% felt neutral and the remaining 27% were disagreeing.

A great majority of the participants believed that mental health care facilities are important aspects to our health care system (89% of participants) and to our criminal justice system (77% of participants). For the vignettes, there were varying results depending on who the shooter was. But for a great deal of the participants believed that if the shooters received some type of mental health care, they would have been less likely to commit those criminal acts. A little more than half of the participants (57%) believed that there is a connection between the lack of mental health care and rise of mass shootings.

4. DISCUSSION

Findings from this study highlight the importance of public attitude toward mental health resources and violent crime. As the government continues to cut deeper into mental health care budgets, research is needed to support the maintenance or creation of organizations and agencies that can fill these gaps. Additionally, the added examination of racial and religious differences will broaden the field of knowledge about the way the public reacts to mass shooting incidents through differing perspectives.

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Porous Scaffolds Composed of Chitosan, Collagen, and Hydroxyapatite for Use in Cancer Therapy Studies

Katelyn Musumeche, Sarah Papadakes, Melanie Sanders, Caleb Chauhan, Dilip Depan*

Institute for Materials Research and Innovation, Chemical Engineering Department, University of Louisiana at Lafayette, *ddepan@lousiana.edu

ABSTRACT

One of the main obstacles in the initial phase of cancer therapy research is the creation of a three-dimensional environment which adequately mimics the environment of cancer cells in the human body. Historically, the testing of potential cancer therapies has been done in two-dimensional spaces, such as a petri dish. This two-dimensional evaluation does not allow for the considerations that human bones are both three-dimensional and highly porous. The fabrication of an environment that closely resembles the extracellular matrix (ECM) of human bone is crucial for the study of interactions between cancer cells and normal cells inside the body. This project focuses on creating such an environment to study the ECM interactions between breast cancer cells and osteoblasts. Three dimensional scaffolds were created using chitosan (CS), a natural biopolymer, collagen (CO), and hydroxyapatite (HAp) to optimize the mechanical and biological properties of the scaffolds. Glutaraldehyde (GLU) was used as a cross-linker between the CS and CO biopolymers. The GLU concentration was varied to evaluate the optimal concentration for mimicking the mechanical and physical properties of the ECM of human bone. The CS-CO-HAp scaffolds were prepared using lyophilization techniques to create porous scaffolds. Scanning electron microscopy (SEM) and confocal microscopy were utilized to study porosity, pore size, and pore interconnectivity. Fourier transform infra-red (FTIR) spectroscopy was used to determine the degree of crosslinking for each concentration of GLU. Physical properties were studied to determine water absorption, retention, and swelling. Our goal for this project is to create a three-dimensional environment to be used for cell culture to study the ECM interactions of bone cells and breast cancer cells in a laboratory setting. The scaffolds created in this project will be used in future studies to evaluate changes in the ECM before, during, and after cancer treatment therapies.

1. INTRODUCTION

Chitosan (CS), a polycationic linear polysaccharide, is created by partially de-acetylating the biopolymer Chitin. Chitin is mainly found in the exoskeleton of crustaceans and insects, as well as in the cell walls of fungi (Ji, 2010). It is considered the second most abundant natural polysaccharide after cellulose. CS has many biomedical uses due to its biocompatibility, non-toxicity, and biodegradability (Ji 2010). Some biomedical uses include materials used for wound cleaning, obesity treatments, and most importantly for this project: scaffolds for tissue engineering. CS is composed of beta-(1-4)-linked D-glucosamine and N-acetyl-D-glucosamine that are randomly distributed throughout the polymer (Nwe 2009). The cationic nature of CS is unique in such a way that it differs from the majority of polysaccharides, which are usually either neutral or negatively charged when in an acidic environment. This cationic nature allows chitosan to form multilayer structures with other synthetic or natural materials that are negatively charged.

While CS alone is suitable for use in artificial tissue engineering, its usability in bone tissue engineering can be improved by mixing CS with other compounds to optimize its mechanical,

physical, and chemical properties. Scaffolds for bone tissue engineering must have adequate mechanical strength in order to maintain their shape and stability while supporting the growth and proliferation of the osteoblasts (New 2009). The scaffolds should also possess physicochemical properties that facilitate matrix mineralization. A high porosity allows for more interconnectivity, which allows for better neovascularization and enhanced nutrient diffusion (Depan 2011).

Type I collagen (CO), the most abundant of the various types of CO, is the type of CO found in the highest concentration in human bones. Bioceramics, such as hydroxyapatite (HAp), improve aspects of the scaffolds that are useful in bone tissue engineering applications, such as mechanical strength and increased porosity. HAp is the usual candidate picked when choosing biocermaics because it closely resembles the inorganic component of bone. The combination of CS and HAp are well known to be among the best bioactive materials used in bone tissue engineering. The addition of CO to the combination of CS and HAp for bone tissue engineering enhances even further the favorable conditions for cell growth and proliferation. In this project, glutaraldehyde (GLU) was used as a cross-linking agent between CS and CO. The concentration of GLU used for crosslinking was varied (0.05% to 0.25%) to study how the degree of crosslinking affects the mechanical and physical properties of the scaffolds. Pure 1% (w/v) CS scaffolds and CS-CO-HAp scaffolds with no GLU were also created for comparison.

2. PROCESS

First, a solution containing 2% (w/v) low molecular weight (LMW) chitosan (CS) in 1% (v) acetic acid was created by magnetic stirring until such time that CS was fully dissolved. The CS solution was added drop wise to an equal volume of 0.2 % (w/v) type I Collagen (CO). The resulting solution had a CS:CO weight ratio of 10:1. The CS-CO solution was stored in a refrigerator at 4 °C, until used to minimize any thermal degradation of CO. Glutaraldehyde (GLU) solutions of 0.25%, 0.10%, and 0.05% (v) were prepared by dilution of stock solution with deionized (DI) water. For every 100 mL of CS-CO solution, 10 mL of GLU was added to the solution and mixed by magnetic stirring for 24 hours. Hydroxyapatite (HAp) was added to the CS-CO solution such that the weight of HAp added equaled 5% of the combined CS-CO weights in solution (e.g. for every one gram of CS-CO in solution, 0.05 grams of HAp was added). The CS-CO-HAP-GLU solution was sonicated in ice water for one hour to ensure uniform distribution of the HAp in solution. A 24-well plate was filled such that each well contained equivalent volumes of the solution. The 24-well plates were placed in the freezer chamber of the freeze dryer at -54 °C overnight. The scaffolds were lyophilized for 48 hours to ensure all water was removed. Immediately upon removal from the freeze dryer, the dry scaffolds were soaked in 1% (w/v) sodium hydroxide for 30 minutes to neutralize any remaining acetic acid residue. Successive DI water washes were performed until the pH of the water removed was neutral. The scaffolds were again frozen overnight and lyophilized for 48 hours to obtain the final three-dimensional scaffolds.

3. CONCLUSION

The purpose of this research is to produce a 3-D scaffold that mimics the extracellular matrix (ECM) of bone. The physical and mechanical properties of the scaffolds will be studied to determine the optimal GLU concentration. Once the optimal scaffold composition has been determined, the scaffolds will be used for the cell culture of both osteoblasts and breast cancer cells (MDA-MB-231) to gain a greater understanding of the interactions between these cell types. It is our hope that the findings of these experiments will expand upon what is already known about cancer by helping us to gain a better understanding of the mechanisms of metastasis as well as the ECM interactions between healthy cells and cancer cells.

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Zinc Oxide Thin-Film Transistors: Bias Stress and Reliability Assessment

Cassandra E. Osborne[1], Rodolfo A. Rodriguez-Davila[2], Manuel Quevedo-Lopez[2], Chadwin D. Young[2], and Jafar F. Al-Sharab[3]

[1]Department of Engineering Technology, Northwestern State University, Natchitoches, LA 71497, cosborne050782@nsula.edu

[2]Department of Materials Science and Engineering, University of Texas at Dallas, 800 W. Campbell Drive, RL 10, Richardson, TX 75080

[3]Department of Engineering Technology, Northwestern State University, Natchitoches, LA 71497, jafar@nsula.edu

ABSTRACT

ZnO thin-film transistors (TFTs) with different semiconductor PLD deposition parameters, along with an atomic layer deposited Al_2O_3 gate dielectric, was subjected to constant bias stress where the gate and drain voltages were stressed simultaneously. The threshold voltage and transconductance were monitored during stress to ascertain semi-quantitative understanding of threshold voltage instability. The differences observed are attributed to the ZnO thin film rather the Al_2O_3 dielectric since the gate dielectric was deposited with the same ALD process prior to PLD of the ZnO semiconducting thin-film. The 30 mTorr ZnO films resulted in worse reliability with an increase in subthreshold slope (SS), degradation in drain current (Id), and an increase in off-state leakage. However, the 20 mTorr ZnO film enables a better performing and more reliable TFT since the drain current is higher and does not degrade as much over time. These issues result in the 30 mTorr samples experiencing greater threshold voltage shifts (DVt), and transconductance (gm) degradation compared to the 20 mTorr ZnO film. In an effort to determine if the ZnO interface or bulk trap generation play a significant role in the DVt degradation, the correlation between gm degradation (i.e., interface degradation) and DVt was done. The results clearly show there is significant influence to the Vt shift from electrically active defects generated at the interface.

Flexible electronics have received notable attention in recent years. Oxide-based semiconductors are attractive due to their compatibility with low-temperature fabrication while having higher mobility when compared to organic-based semiconductors. Among flexible semiconductors, ZnO is one of the potential candidates to be used as an active layer in thin-film transistors (TFTs) due to its transparency, inexpensive processing and noteworthy electrical performance [1-3] and possible uses in flexible circuitry [1]. However, to be flex-compatible, high-k gate dielectrics must also be deposited at these low temperatures as well. With all the low-temperature processing, thin-film transistor (TFT) reliability must be evaluated due to threshold voltage (Vt) instability experienced by TFTs with high-k dielectrics [4-6]. In this work, TFTs are constant voltage stressed while monitoring the threshold voltage and transconductance (gm) to assess the reliability of ZnO-based TFTs.

All collected data were measured using the Keithley 4200 SCS. It was generally observed that there is a loss of performance after repeated stress via the loss of drain current, increasing threshold voltage, and changing transconductance. Figure 1. Shows an example of the evolution of I_d-V_g degradation for the in the 20 mTorr sample which shows improved reliability

In conclusion, constant bias stress, where the gate and drain voltages were stressed simultaneously, was executed on ZnO thin-film transistors (TFTs) with different semiconductor PLD deposition parameters. The threshold voltage and transconductance were monitored where 30 mTorr samples had greater threshold voltage shifts, and transconductance (gm) degradation compared to the 20 mTorr ZnO film. The correlation between gm degradation (i.e., interface degradation) and DV_t was done, and the results demonstrate that there is significant influence to the V_t shift from electrically active defects generated at the interface.

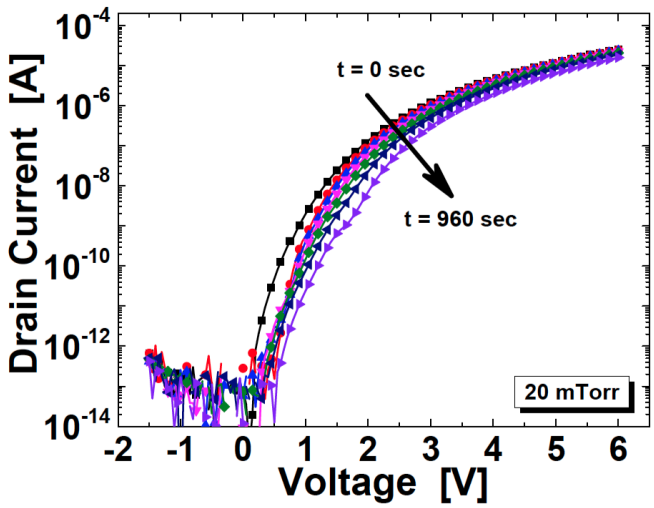

Fig. 1. Example of the evolution of I_d-V_g degradation for the in the 20 mTorr sample showing improved reliability

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Tunable Polymer Nanocomposites via Interfacial Crystallization: Applications Specific for Biomedical Engineering

Padma N. Pellegrin[1], Nina Collazos, Tuan Le, Arafat Noor, Ramalingam Subramaniam, Dilip Depan[2]
Chemical Engineering Department, University of Louisiana at Lafayette, [1]rxs2951@louisiana.edu, [2]ddepan@lousiana.edu

ABSTRACT

Copolymers are useful in a wide variety of applications, one of which being their potential to facilitate novel biomedical advancements via crystallization onto nanoparticles. Block copolymer (polyethylene-b-polyethylene glycol) (PE-b-PEG), when crystallized onto nanoparticles, has the potential to form a variety of structures. The type of structure formed depends on many factors, including the structure of the nanoparticles, crystallization time, undercooling temperature, polymer concentration, solvent selection, etc. One highly desired structure created using the techniques presented in this research is known as the nanohybrid shish-kebab (NHSK) structure. The NHSK structure has the potential to be useful in biomedical engineering applications due to its unique shape and large surface area. Functionalized nanoparticles provide an optimal surface on and around which copolymers can crystallize, leaving a rough nanoscale surface. These surface features allow for the creation of the maximum number of potential cell attachment sites. Various nanoparticles can be used for crystallization, each yielding its own tunable results. Creation of this structure begins with nanoparticles being sonicated to decrease size. The sonicated nanoparticles are combined with melted block copolymer, and the resulting solution is cooled to begin the crystallization process. By varying the previously mentioned factors, tunable polymer nanocomposites are formed. Overall, this process has a quick production time. Scanning electron microscope (SEM) images depict the variety of ways in which the copolymer reacts to different nanoparticles. These SEM images can also be used to quantify the variation in the structural features of the polymer nanocomposites, such as diameter, periodicity, and thickness of the NHSK. Crystallization occurs in a positive manner for all combinations of copolymers and nanoparticles evaluated thus far in the project; still, research continues to determine the optimal combination to create consistently stable nanocomposite materials.

1. INTRODUCTION

The purpose of crystallizing a polymer onto various nanoparticles is to produce a specific, unique, and tunable structure with large surface area: the nanohybrid shish-kebab (NHSK). The crystallized polymer acts as a site for cell attachment and the shish-kebab structure provides a large surface area for the attachment of cells, primarily osteoblasts. The goal of this project is to create a surface with which osteoblasts react positively. Ideally, osteoblasts will attach to the polymer's rough, crystallized surface and cell growth and proliferation will be sustained. To ensure this is possible, the (polyethylene-b-polyethylene glycol) (PE-b-PEG) copolymer used for the crystallization is composed of 50% PE and 50% PEG. Experimentation has also been done wherein the PE/PEG ratio was varied. The PE allows for crystallization of the polymer onto the nanoparticle surface, while PEG provides an –OH functional group. The hydroxyl group in the copolymer is essential for the process of cell attachment, promotes cell growth, and also allows

for the attachment of supportive drug molecules. The use of nanoparticles promotes polymer crystallization and improves the desired properties of the finished product. The ratio of nanoparticles to copolymer is varied from experiment to experiment. The crystal size increases with increasing polymer concentration. However, with too much polymer, the shish-kebab structure can become almost unidentifiable.

2. PROCESS

The process for creation of the shish-kebab structure begins with a sixty-minute sonication of the nanoparticles being utilized. The nanoparticles are sonicated utilizing toluene as the solvent, the volume of which is varied depending on the desired concentration of the final solution. Several nanoparticle types have been used as the surface on which crystallization occurs with the PE-b-PEG copolymer: Carbon nanotubes (2 nm), carbon nanofibers (100 nm), graphene, clay, and modified clay. Each nanoparticle has its own unique shape and surface features which affect the crystallization process. While the nanoparticles are being sonicated, the PE-b-PEG copolymer is melted by heating for 60 minutes at 120 °C in toluene, the volume of which can also be varied to best suit the experiment. The sonicated nanoparticles and melted copolymer are combined in one flask which is then held at 80°C for sixty minutes, during which time crystallization takes place. The one-hour time interval ensures that the desired shish-kebab structure will have ample time to develop fully. During the crystallization process, the copolymer coats the nanoparticle strands to form the desired crystallized structure. The large surface area of the nanoparticles serves as the structured template for polymer crystallization. This process transforms the copolymer and nanoparticles into a stable nanocomposite material than can be used in biomedical applications. Depending on the nanoparticle used, the shish-kebab structure has presented itself in different ways. The tubular structure, curved surface, and large surface area of carbon nanotubes provide a suitable surface for polymer crystallization into the NHSK structure. Carbon nanofibers have the same advantages as carbon nanotubes but are much larger. Graphene, while similar in chemical composition to the carbon nanotubes and nanofibers, possesses a sheet-like structure. Other nanoparticles used are modified clay and clay, both of which have a stacked structure which allows for several layers of crystallization. The crystallization mechanism on these various surfaces is vastly different, yet each finished product still presents as a shish-kebab structure of some kind.

3. CONCLUSION

The greater purpose of this research is to develop a steady product that can actively be used in biomedical applications to promote cell growth. Further research is currently being conducted to determine the appropriate combination of polymers and nanoparticles for future use in biomedical applications.

Demo of Secure Semantic Search Over Encrypted Data on the Cloud

Hoang Pham[1] and Mohsen Amini Salehi[2]
[1]hhp6148@louisiana.edu, [2]amini @louisiana.edu
High Performance Cloud Computing (HPCC) Laboratory
University of Louisiana at Lafayette

ABSTRACT

Cloud Computing is becoming dominant and uti- lized across various industries. Parallel with the growth of the Cloud Computing is the security and privacy concerns that cloud users have to delegate their data ownership to the cloud. Encrypting data before outsourcing them to the cloud is a popular solution to protect confidentiality of users, however, it is achieved with the sacrifice of fundamental functionality to search and retrieve data, since the traditional search does not work with encrypted data. This paper introduces a system, called S3C, that allows users to securely store their data files (*i.e.,* documents) in the public cloud storage and also supports the mechanism to semantically search and retrieved their documents in the ranked order.

Key Words: Demo, Search over Encrypted Data, Cloud Security, Encrypted Search

1. INTRODUCTION

Cloud computing is the imminent future of the technology world for its application to many industries. It is favored by many businesses and users thanks to its cutting-edge advantages including easy access, regular back up, and low cost of maintaining software and hardware. However, cloud computing is still considered to develop below its potentials due to major concerns about its privacy. When uploading documents to the public cloud, user no longer physically controls his data, the data is delegated to the cloud and its internal employees. Thus, the data is exposed to many potential threats inside and outside of the cloud.

In order to restraint the privacy risk, users can encrypt their data before uploading them to the cloud. By doing so, the encrypted data securely resides on the public server. However, as the data is no longer in plain text format, the traditional searching mechanism cannot work and user would find it difficult to search over their data files. A trivial solution is to download the entire data collection, decrypt them locally and then perform the traditional searching method [3]. This approach is impractical due to the limited bandwidth and volume of data stored on the cloud. Searchable Encryption is introduced as a pragmatic way to solve this problem. Such sysytems allow a user to upload encrypted data to the public server and also provides a secure search mechanism. However, specifically on big data scale we need to search the data in a *semantic* manner. That is, the ability to search the meaning of the data, not only exact keywords in the query.

In this research, we introduce a system that implements the Searchable Encryption architecture, called Secure Semantic Search over Encrypted Data on the Cloud (S3C). The system is a model of the secure search system that users encrypt their text documents and send

them to the cloud. Later, they can search and retrieve their data files in a relevant ranking order for a given search query. The main contributions of our research are as follows:

- Developing a Secure Searchable Encryption system, known as S3C.
- Provide a fully functional platform that users can securely store, semantically search, edit and delete their documents on the cloud.

2. OVERALL ARCHITECTURE

Searchable Encryption system architecture that we propose is depicted as below Figure II. The Searchable Encryption system contains three main components:

- Data owner: individual who has a collection of files $D = \{d_1, d_2, d_3, \ldots, d_n\}$ which he wants to outsource to the public cloud.
- Data user: anyone, can also be the data owner, who is authorized to access the data (authorization using some kind of key distribution) [4]. Data user is allowed to send encrypted query to the cloud server and received result of related files.
- Cloud server: remote cloud storage that receives up- loaded, encrypted documents from data owner. Cloud server processes related data information and stores the data. Upon receiving the trapdoor query from the data user, it performs securely searching method and returns the matched result. The server is assumed to be “honest- but-curious”, meaning although the server administrator follows necessary security procedures and does not modify nor delete data files, she is still “curious” about the content of the data [1]. Public cloud servers are not allowed to compromise data privacy.

Initially in the set up phase of our system, data owner has a collection of files $D = \{d_1, d_2, d_3, \ldots, d_n\}$ that he wants to outsource to the public cloud. The data owner generates the secret key which is then used to encrypt his data file. Before being sent to the cloud server, the document is parsed to a text extractor, Maui [2], to get its top k important keywords. The extracted keyword file is then hashed to form a key file. Together, the encrypted document and hashed key file are sent to the cloud server and reside there. On the other end, the cloud server receives the uploaded key file and encrypted text file. It stores the document in a storage and reads the key file and then writes to its Index File. The cloud Index File is an inverted table, where each entry is a hashed keyword and a set of file name that contains that word. After the process, the cloud server is ready to the retrieval phase.

In the retrieval phase, the data user has a query to retrieve his interested documents. However, he may not remember the exact keywords, phrases in the actual document or he also wants the results containing related files to his query. Through our system, the query got extended its meaning using:

- Query permutation technique: to get all of the combination of phrases and keywords from the existing query.
- WordNet API: to get the synonyms of the query permutation by calling to the API.
- Wikipedia: we download the Wikipedia page of the query permutation. Using the Maui extractor [2], we get the top k words from the content of that Wikipedia page

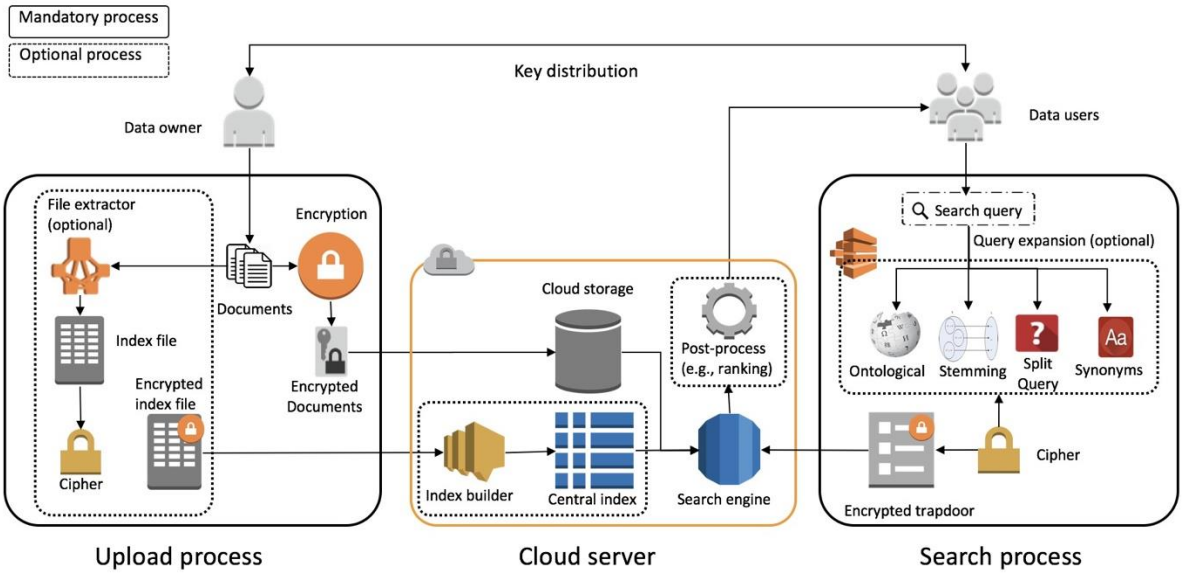

Fig. 1. Overall Architecture of Cloud-based Secure Search Systems.

This process ensures that the query is extended to the most possible semantic meaning that the user wants to retrieve. Each of the extended keyword is assigned to a weight representing how relevant it is to the entire query. Then, using the hashing function, the keyword is hashed and attached with its score to form a trapdoor. The trapdoor is then sent to the cloud server. In the cloud server, the trapdoor is used to search against the clouds Index File. Upon the returned matched result, the cloud server gives the score of each document based on its relevance to the initial query, using a modified BM25 equation [5] based on the frequency of the query keywords and the length of the document.

3. IMPLEMENTATION OF S3C

The web interface is a demonstration to the S3C platform. This is hosted in Amazon Linux Server (EC2 Small Instance) using PHP/HTML/CSS/Javascript and Bootstrap in the front- end/back-end and Java JDK 1.8 as the running environment.
The web interface has two parts: server side and client side

3.1 Server side

On the server-side we have a Runnable JAR file. The server- side listens to different requests in different ports which each listener is processed by different threads. Upon the request type the JAR file would process with given parameter and print out the output. Currently, there are 3 listeners in the server-side:

- Upload (port 8080)
- Search (port 9090)

- Remove (port 7070)

The upload listener receives a path name of a folder to be uploaded as parameter. After that, it uploads all of the files in the given folder path and cleans up that folder when completes uploading. If any error happens, it would notify user. The search listener, on server-side, receives Object of ArrayList casted in form of a String. The process would return the result as an ArrayList casted in a String. The remove listener receives the name of the file to remove and returns the message to inform the result.

3.2 Client Side

On the client-side, there is a Runnable JAR file of the client- side system. The client-side sends requests to appropriate ports of listening threads in the server side. The client side is programmed to run different operations including:

- Upload (port 8080)
- Search (port 9090)
- Remove (port 7070)

For remove function, the client-side takes in the file name and sends it to port 7070 (designated to receive remove request). The server deletes the encrypted file and key file in the storage folder. Then, it removes the key and value of the file in the inverted table of the IndexFile.

For decryption function, the client-side takes in the filename to decrypt. Then it loads the keyphrase (encryption/decryption key) and the encrypted file to a Java built-in function to decrypt the file.

For search function, the client inputs a query to the system. It is semantically expanded based on the following options:

- Query permutation (0)
- Synonyms extension (2)
- Wikipedia extension (3)
- All of the mentioned options (1)

This expanded query is assigned to different weight based on the keyword relevance and then gets encrypted and sent to the cloud.

For upload function, the user provides path to the uploaded folder, the client-side program parses the folder for text files, extracts keywords from them using a tool called Maui [2] into .key files, encrypts the plain text documents and hashes the key files. The encrypted documents and hashed .key file are sent to the cloud for storing.

3.3 Web Interface

The homepage of the web interface contains a navigation bar to switch between Search tab and Upload tab. The Search tab includes a search box to enter the query III-C and the Upload tab includes an upload area that allows only text file to be uploaded III-C.

When the user searches for a query, the server returns a result of top 10 files most related to the query search. Each entry has the ranking order, file name, details (showing the score that the system gives to that files in respect to the query term) and list of operation options (including Edit, Remove, Download encrypted file and Download key file) III-C.

Operation on each entry:

- Edit: pop up a editor to edit the file, after editing, user can save changes being made and go back to the result list III-C. The edit option is basically applying decryption function of the client-side system to get the plain text document to edit, and removing the outdated one and then uploading the updated documents. It worths noticing that the edit function is used to check the content of the document, not that the document is stored unencrypted on the cloud.
- Remove: remove the file from the system. Display a message if the remove is done.
- Download encrypted file: allow user to download the encrypted file stored in the system.
- Download key file: show the extracted, encrypted, impor- tant keywords of each document.

Upload part allows user to upload a text file to the system. There will be a filter that only show text file that user can upload in his/her local repository. At first, the file is uploaded to the system as the original plain text file to the assigned upload folder. Then, the JAR file of the client-side encrypts the file and extract the key term of that file which is then hashed. After that, the encrypted file and key file are being sent to the server-side to store and the hashed key file is added to the IndexFile. The plain text of the document will be removed to ensure our goal of making the whole storage is encrypted and secured.

Command to run the S3C project: This is the URL of the web interface.

Command to run the server-side (general): java -jar S3Cloud.jar

On client side:

- To search: java -jar S3Client.jar -s [query] n [*]
- To upload: java -jar S3Client.jar -u [relative path of folder to upload]
- To remove: java -jar S3Client.jar -r [file to remove]
- To decrypt: java -jar S3Client.jar -d [file to decrypt]

[*] n: options how the query is expanded: 0: just query permutation 1: full options 2: just synonyms 3: just Wikipedia

4. CONCLUSION

Searchable Encryption is solving the problem that induces the potential growth of the Cloud Computing. It both provides a solution to the security and privacy of users and novel searching mechanism that also works on encrypted data. Our demo of S3C is a prototype of Searchable Encryption which is composed and applied its architecture and methods. S3C securely stores and semantically retrieves data on the public cloud. In future work, we would implement the searching mechanism to improve the performance of the system in order to work with Big Data scale information.

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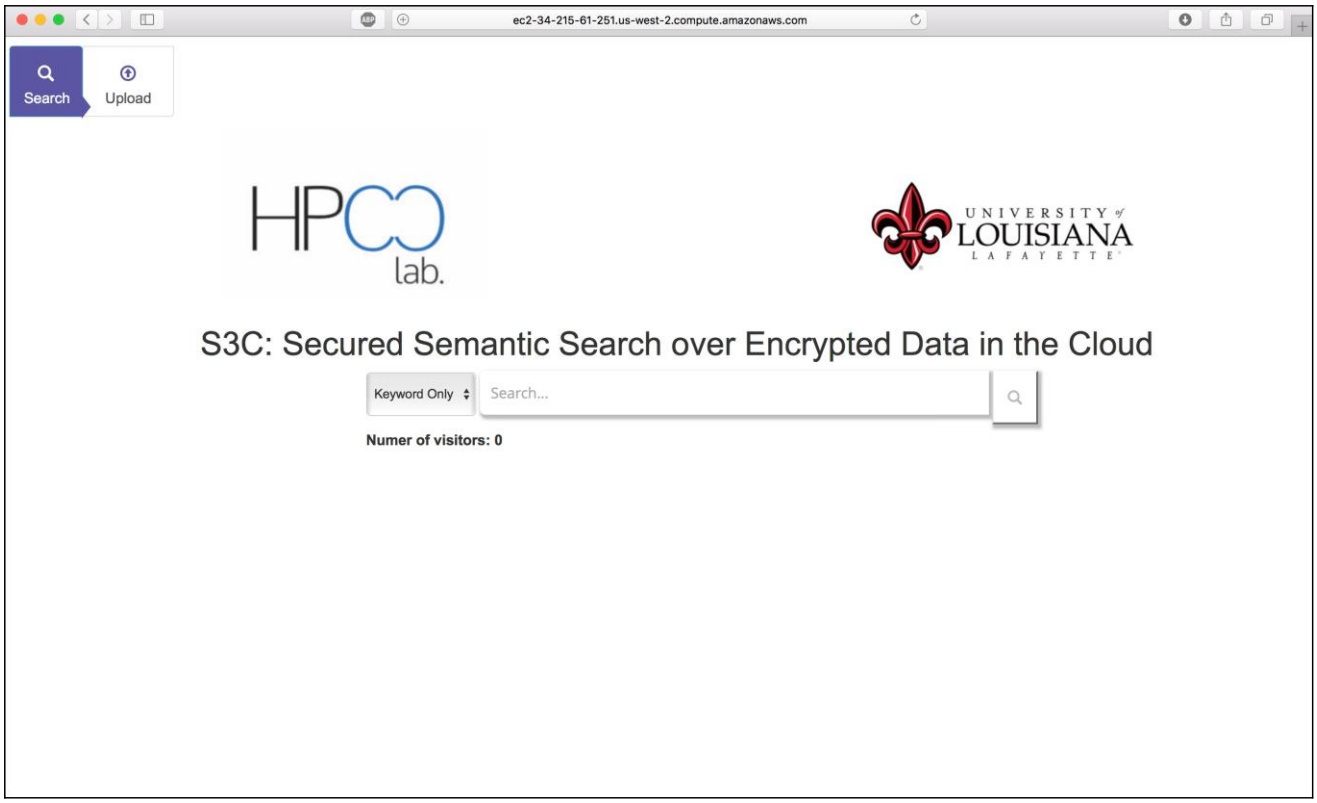

Fig. 2. Web Interface of S3C: Searching Part

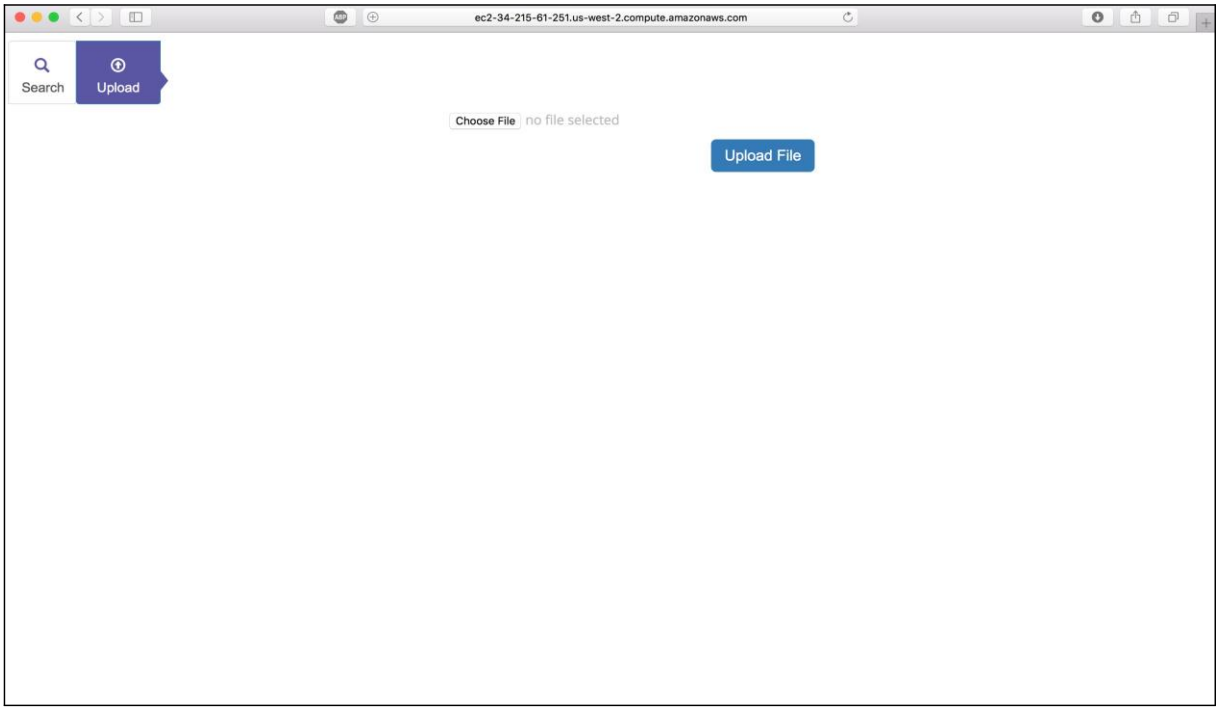

Fig. 3. Web Interface of S3C: Uploading P

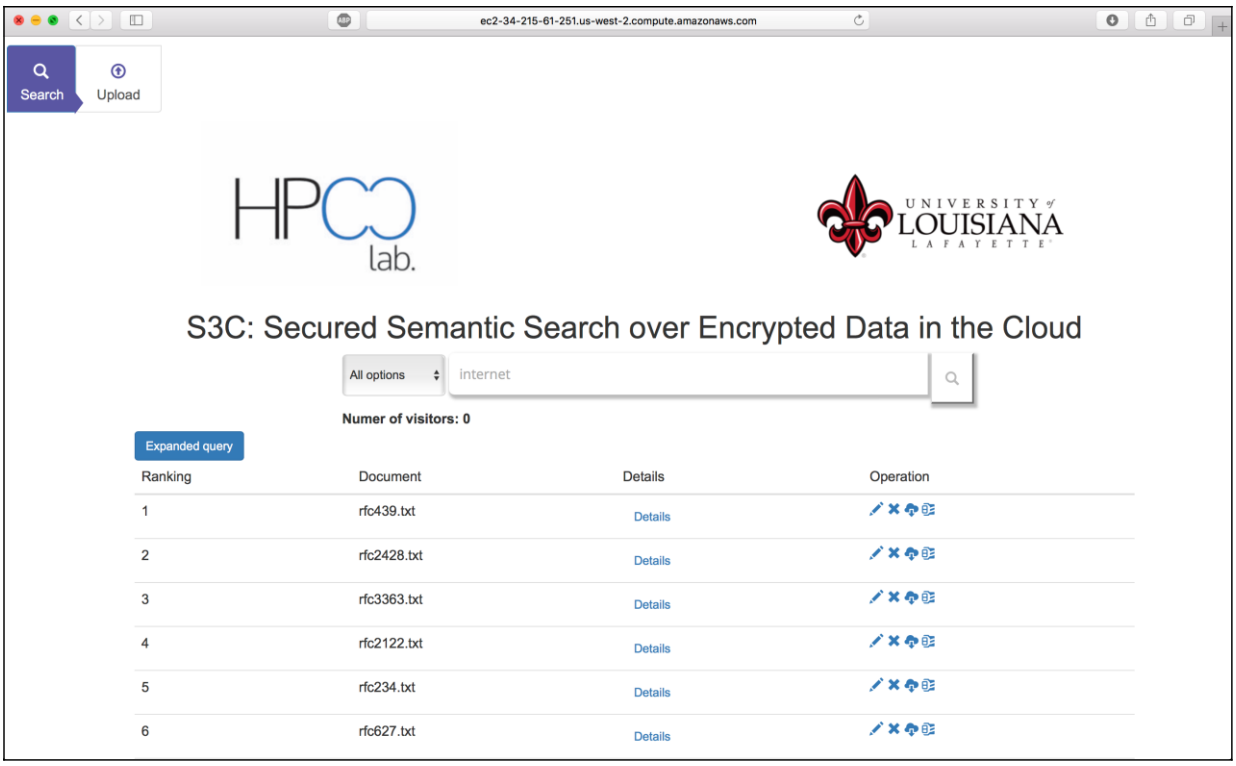

Fig. 4. Search result in ranked order

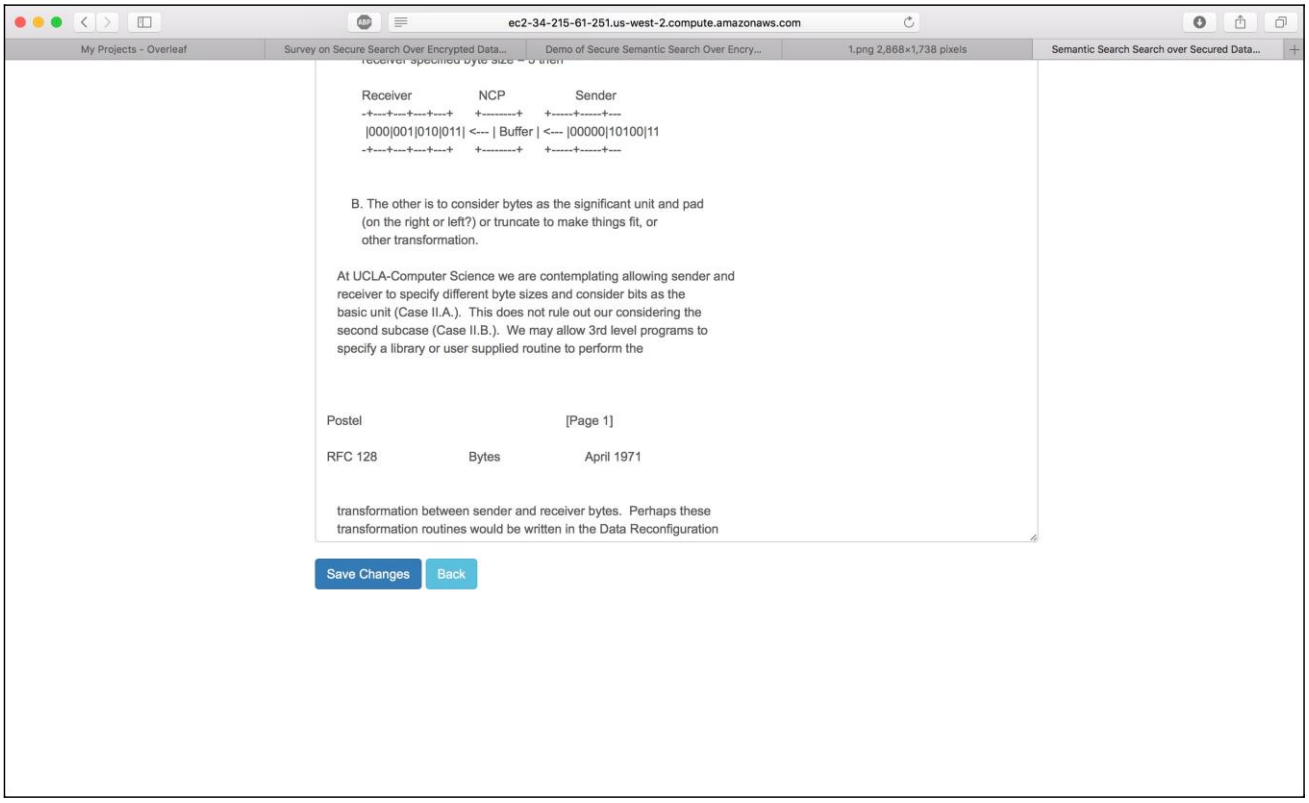

Fig. 5. Edit text area on the web interface

A Study of the Effects of Soiling on Concentrating Solar Power

Matthew Joseph Prilliman[1]
[1]University of Louisiana at Lafayette, mjprilliman@gmail.com

ABSTRACT

Soiling of solar collector mirrors in concentrating solar power (CSP) applications is a major factor influencing component and system reliability, thermal efficiency degradation, and minimization of maintenance costs. Research is needed to identify mechanisms to minimize soiling or dust accumulation effects in different geographic and climatic regions as deposition on mirrors is location-specific and modulated by several factors, including soil parent material, microclimate, and frequency and intensity of dust events. With over 300 publications generated in the last five years alone, the effects of soiling and particle accumulation on solar power is a high interest topic. The UL Lafayette Solar Technology Applied Research and Testing (START) lab consists of a large aperture parabolic trough CSP facility in operation since 2013 where spectrometry measurements are taken regularly as part of plant operation and evaluation of the degree of soiling that the reflective surfaces have undergone. Based on operational outcomes, recommendations regarding cleaning procedure and frequency have been developed and are reported. Several models and generations of reflector composition have been evaluated, covering three generations of thin-film polymer chemistry and including several assembly methods. A low-cost gloss meter is used for spectrometry measurements for detecting reductions in specularity which are correlated to the actual plant energy production. This study analyzed solar collector soiling data for three different thin film types: 3M 1100, 3M 2020, and Konica Minolta film mirror. The data, along with parabolic trough cleaning costs and energy pricing considerations, was used to determine the optimal days between cleaning. Analysis of the results reveals that the 3M 2020 film has the fastest soiling degradation rate, and that the mirrors washing rate should be increased from its current standard to optimize cost savings.

Key Words: Concentrating Solar Power, soiling, reflectivity, O&M

1. BACKGROUND

There is a recent emphasis of the improvement of the cost-competitiveness of Concentrating Solar Power (CSP) technology as the Sunshot Initiative of the Department of Energy (DOE) has met its goal for cost-competitive photovoltaic (PV) energy production three years ahead of schedule. As a result of this achievement, the Initiative's new focus is on making CSP technology cost-competitive, with the 6₵/kWh by 2020 goal shown in Figure 1. Achieving this new goal requires research into how to improve the energy pricing of parabolic trough solar concentrators, which are the most mature CSP technology on the market today. Improving the amount of solar resource that the parabolic mirrors can harness, and subsequently lowering the price of energy production, requires a better understanding of how soiling affects the reflectivity of the mirrors over time.

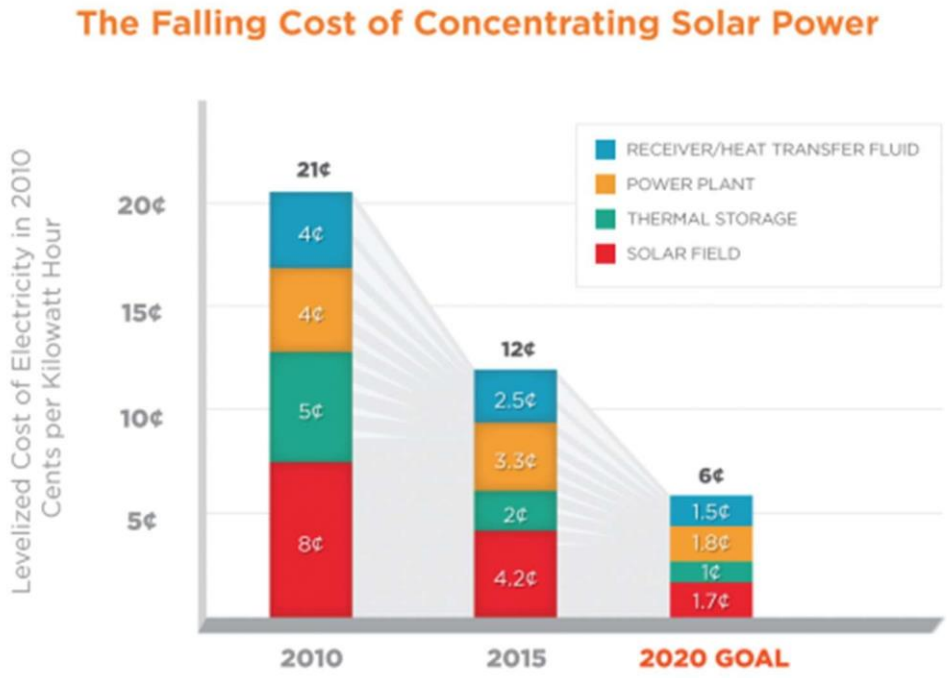

Figure 1. DOE's SunShot Initiative LCOE Goals

Parabolic trough systems are most effective when developed on a large scale in open areas with few buildings and ample sunlight. Such areas are often characterized by large amounts of sand and pollen that often accumulate on mirror surfaces as a result of wind and other weather concerns. This phenomenon is known as soiling, and it has the potential to drastically limit the reflectivity of mirrors, which results in less heat absorbed onto the system's heat transfer fluid and a lower overall system efficiency. While soiling in solar power production has been of high interest in the last 5 years, with over 300 being papers being published, research is needed to identify mechanisms to minimize costs due to soiling effects and optimize profit.

Mirror reflectivity analysis is driven by experimental data of the specular reflection of concentrating mirror surfaces. According to 3M, specular reflection consists of the spectrum of light that is reflected at an angle equal and opposite to that of the incident light beam (Reflectivity, 2004). The Byk-Gardner micro-TRI-gloss glossmeter, which is shown in Figure 2, is used to measure the reflectivity of the concentrating mirrors offers a portable, accurate, and easy to use means of measuring reflectivity.

Figure 2. Byk-Gardner micro-TRI-gloss glossmeter

This glossmeter measures the reflectance at an angle of 20° to the mirror surface and is accurate within 2% for highly reflective surfaces. It consists of a camera-shaped device and a standard that consists of a true black sample that the glossmeter can be operated against for calibration.

2. EXPERIMENTAL METHOD

The reflectiveness of the solar collectors of the UL Lafayette Solar Technology Applied Research and Testing (START) Lab, shown in Figure 3, has been monitored since the first day of plant operation in 2012.

Figure 3. START Lab Concentrating Mirrors

In 2015 a study was conducted on mirror soiling at the START lab. For one year the mirrors were not washed allowing soiling effects to accumulate. Figure 4 shows the results of

this reflectivity monitoring, expressed in gloss units (GU), for the year 2015. Although the SMF 2020 had degraded over 20% the mirrors still had higher GU reading that other thin-films tested. After washing the 2020 film was restored back to new specifications within error tolerance.

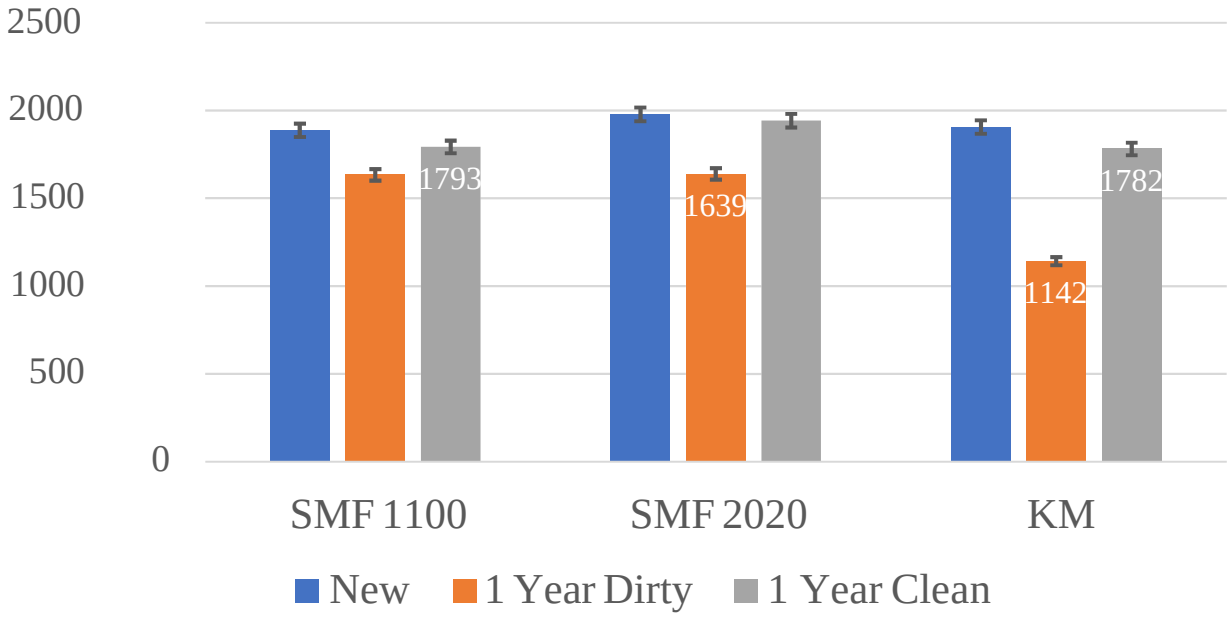

Figure 4. 2015 Mirror Film Reflectivity

The washing procedure currently employed at the plant involves using a pressure washer with deionized water and a microfiber cloth attached to a pole brush designed by 3M.. This brush consists of a long pole attached to a brush head that clamps the microfiber cloth down on a sponge that has running water flowing to it to reduce surface friction. Mirror cleaning consists of an initial spray of water with a pressure-washer, followed by wiping with the brush before the mirrors are sprayed again. Figure 5 shows the equipment and methodology of the mirror cleaning procedure.

Figure 5. Mirror Washing Procedure

Following the May 2017 mirror cleaning, the glossmeter was used to take weekly reflectivity measurement of the entire mirror field. The three types parabolic trough reflector thin film tested in this study are 3M 1100, 3M 2020, and Konica Minolta film mirror. Two measurements were taken per panel, so 480 measurements were taken each week. The distributions of measurement per panel type is shown in Figure 6.

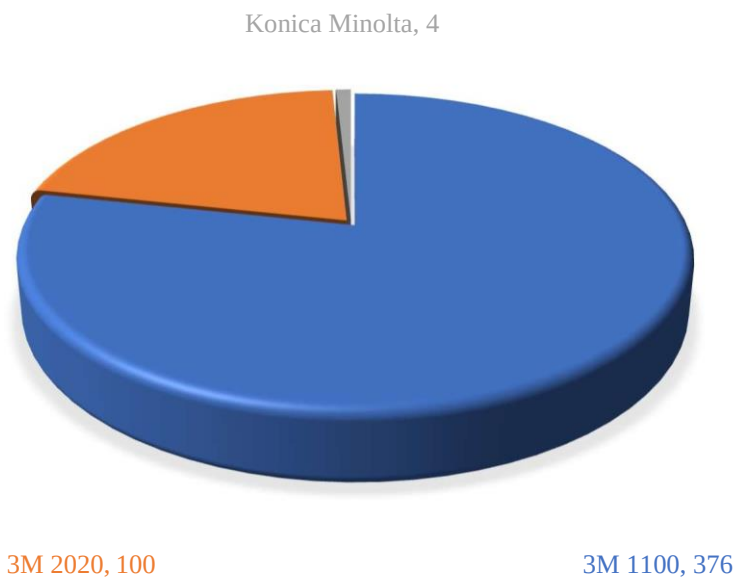

Figure 6. Reflectivity measurement distribution among 3 panel types

These measurements were transferred to Excel for analysis, with the output, shown in Table 1, consisting of the measurement in gloss units (GU), panel location, and timestamp information.

Table 1. Sample of glossmeter measurements at 20° incidence angle

Sample:			Comment:	20°
SAMPLE 001	East Inboard	Frame 1	09/06/17 01:51:17pm	1713
SAMPLE 002	East Inboard	Frame 1	09/06/17 01:51:20pm	1737
SAMPLE 003	East Inboard	Frame 1	09/06/17 01:51:23pm	1744
SAMPLE 004	East Inboard	Frame 1	09/06/17 01:51:26pm	1624
SAMPLE 005	East Inboard	Frame 1	09/06/17 01:51:29pm	1719

3. RESULTS AND ANALYSIS

The rate of soiling over the summer season of 2017 for the three different types of reflector thin-film used in the plant is shown in Figure 7.

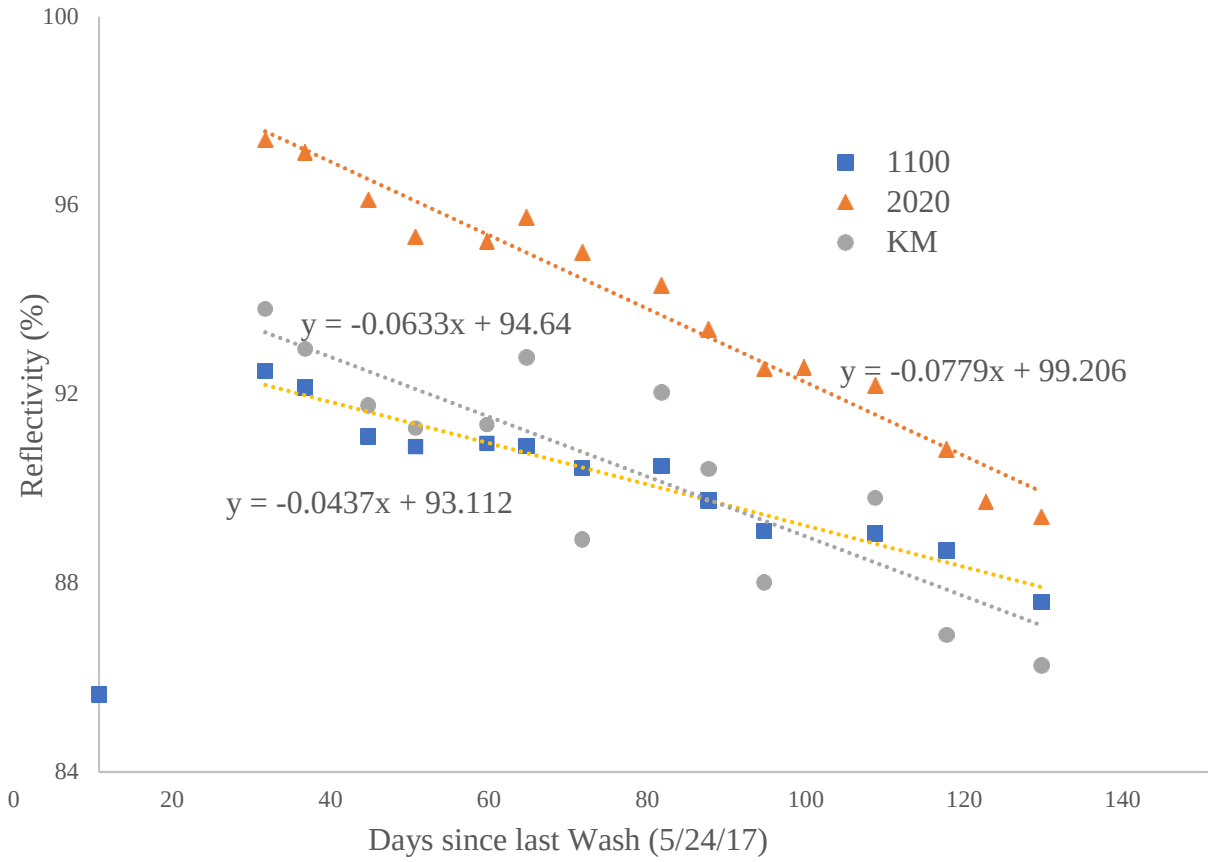

Figure 7. Soiling Degradation Rates for 3M 1100, 3M 2020, Konica Minolta Mirror Films

Analysis of the data shows that the rate of soiling is approximately linear for each of the three films. The soiling degradation rates of the 1100, 2020, and Konica Minolta films are shown in Table 2. This graph shows that while the 2020 film offers higher maximum reflectance values when clean, it also degrades at a rate superior than that of the other two films. The most recent measurement, taken approximately 4 months after the mirrors were washed, shows that the 2020 film is still the most reflective despite its high soiling rate. Based on this analysis, the 2020 is the film with the best reflectance properties for the START lab CSP plant in Crowley.

Table 2. Soiling Degradation Rates

Film Type	Soiling Degradation Rate (%/day)	4 Months Post-Wash (%)	Reflectivity after Wash (%)	Reflectivity when New (%)	Percent Change (%)
3M 1100	0.0437	87.6	92.5	94.4	2.0
3M 2020	0.0779	89.4	97.4	98.9	1.5
Konica Minolta	0.0633	86.3	93.8	95.3	1.6

The soiling rates shown in Figure 5 are one of several parameters that go into the equations derived by Sandia National Laboratories for determining the optimal cost-effective cleaning schedule for concentrating mirrors (Bergeron, Freese, 1981). This equation can be expressed by:

$$N_C = \left(\frac{2W}{A_0 I_0 D C}\right)^{\frac{1}{2}} \quad (1)$$

Where N_c is the ideal number of days between mirror cleanings, W is the cost of this cleaning per square meter of surface area, □□ is the optical efficiency of the mirrors, I_o is the average daily solar energy available per square meter of surface area at the location in question, D is the soiling rate of the mirror surface as a percentage of the restored reflectivity value, and C is the energy price, expressed in dollars per kilowatt-hour, at the specified location (Bergeron, Freese, 1981). The energy pricing information is based on the U.S. Energy Information Administration's commercial pricing data for July 2017.

For the state of Louisiana, a □□ of 114 days was obtained. This calculated □□ would indicate that the mirrors should be washed every 114 days or about 3 times a year to optimize the system accounting electricity and maintenance costs. Louisiana has one of the lowest electricity cost in the country. Keeping all other values constant, states with higher electricity prices such as California and Hawaii would require 4-6 mirror to optimize cost.

4. CONCLUSIONS

The underlying importance of this work stems from its ability to instruct other potential CSP plant operators on the proper mirror washing and maintenance schedule for this geographical area. Any future solar thermal plants developed in the area could base their mirror cleaning procedure on these findings, or could use the same test procedure to determine their own cleaning schedule for different panel types, soiling conditions, and energy pricing considerations.

4.1 Future Work

Research into the effect weather conditions could potentially has created a need for further experimentation into using light rainfall as a supplementary mirror cleaning. To gain a better understanding of the potential benefits of such a practice, there are plans to experiment to setting the parabolic trough hydraulic system to automatically turn to an angle of 90 degrees (mirrors facing skyward) when rainfall with low wind speed is detected. Achieving such a system requires accurate weather data, specifically rain rate and wind speed data, that is interpreted by the system Human Machine Interface (HMI) in order to automatically turn the mirrors. This will be accomplished through installation and integration of a Davis Instruments Vantage Pro2 weather station. The results of this experimentation will be considered alongside the results described previously to determine whether this automatic washing improves plant profitability.

This experiment also revealed the need for further development of the experiment and advanced analysis. Additional system efficiency data for the plant is necessary to relate efficiency to reflectivity and validate previous assumptions regarding this relation. Weekly interruptions of the apertures' hydraulic tracking system for reflectivity measurements revealed the need for a separate apparatus designed exclusively for soiling studies. A rendered image of said apparatus, which will be used in future experiments, is shown in Figure 8. These additional experimental considerations, when combined with the work described in this abstract, will further define the standards of reflectivity maintenance for CSP plants.

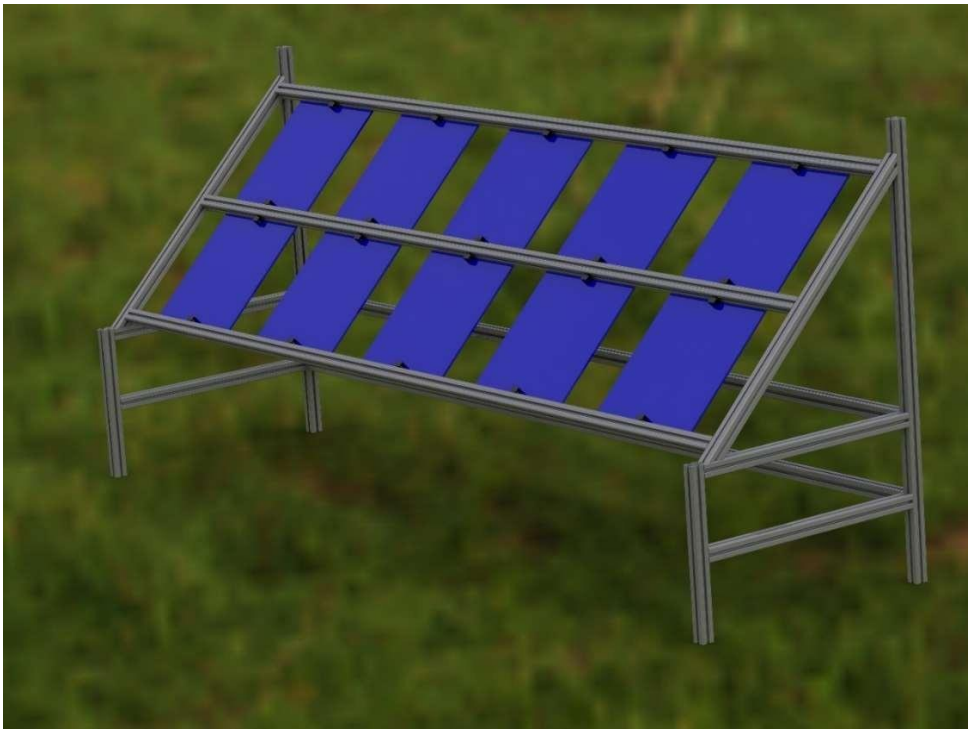

Figure 8. Rendered Image of Aluminum Soiling Study Test Rack

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Is There A Gender Difference in Social Physique Anxiety Among College Students?

Tyana Rapp
Louisiana State University of Alexandria,
8100 Highway 71 South Alexandria, LA 71302,
Trapp001@lsua.edu

1. INTRODUCTION

The purpose of this study was to determine if there was a social physique anxiety among non-athletic male and female college students. The study also explored if the amount of times a college student exercises per week influence his or her social physique anxiety level. According to Sara Rothberger (2014), social physique anxiety is the anxiety people experience when they are worried about others' evaluations of their bodies. One's physique is defined as the form, size, and development of a person's body.

2. PARTICIPANTS

The researcher surveyed an even number of both male and female participants; 20 males and 20 females. A total of 40 participants were surveyed, and volunteered participants of the study were 18 and older. Six surveys were discarded because participants either failed to sign the consent form or complete the SPAS. The age range for both male and females was 18-22. Of the male participants, there were eight freshmen, two sophomores, three juniors, and four seniors. However, the female participants consisted of three freshmen, five sophomores, three juniors, and six seniors.

Participants for this study were recruited in various ways. Students were either recruited via email from Louisiana State University, Louisiana College, Spelman College, Dillard University, Our Lady of the Lake Nursing School, and Nicholls State University. Additionally, students were also randomly selected from Louisiana College campus. Regardless of recruitment method, each student signed the consent form and completed the SPAS.

3. ANALYTIC STRATEGY

Data were analyzed using standard deviation (SD), t-test and the average of male and female SPA scores to compare the results. The mean assisted the researcher in analyzing whether males or females have higher SPA scores. Calculating SD will indicate the extent of deviation between males and females regarding SPA. T-tests results were used to analyze the difference between males who take part in physical activity and males who do not, females who take part in physical activity and females who do not, and the overall SPA average between both males and females. The original 12-item Social Physique Anxiety Scale created by Hart, Leary, and Rejeski was used. Additionally, participants circled their gender (male or female), and how frequently does he or she exercise per week?

4. RESULTS

Two hypotheses were guiding this study. The first hypothesis was female college students would have higher levels of social physique anxiety compared to male college students. Male college students (n=17) had a mean score of M=31.88 for the SPA Survey with a standard deviation of SD= 5.00. Female college students (n=17) had a mean score of M= 35.65 for the SPA Survey with a standard deviation of SD= 6.06. The means for both groups indicate a

moderate level of physique anxiety with females being slightly higher. The results of this study support the hypothesis that female college students have higher levels of social physique anxiety when compared to male college students.

The second hypothesis guiding this study was college students, male or female, who exercise 4-5 times per week would have lower social physique anxiety scores. Men who moderately exercise have higher social physique anxiety than other men who consistently or seldom exercise. Women who exercise one to three times per week have higher social physique anxiety compared to women who moderately or never exercise. The results of this study did not support hypothesis two indicating that college students, male or female, who exercise 4-5 times per week will have lower social physique anxiety scores.

5. DISCUSSION

One hypothesis guiding this study is that male college students would have lower social physique anxiety than female college students. Results for this study supported this hypothesis is consistent with other existing research. Studies conducted by Sara M. Rothberger (2014) and Chu, Bushman, and Woodard (2008) has confirmed that female college students have higher SPAS than male college students. In 2014, Rothberger conducted a study analyzing the relationship between SPA, gender, self-efficacy among college students enrolled in physical activity courses. Rothberger proposed that "those will higher self-efficacy would display lower levels of SPA and vice versa, women would display higher SPA than men, and both self-efficacy and gender would account for a significant proportion of SPA variance (Rothberger, 2014, p. 27)." Rothberger reported (2014), results indicated that women displayed higher SPA than men ($p = .004$), and individuals with low self-efficacy displayed higher SPA than their respective counterparts ($p < .001$).

The second hypothesis guiding this study predicted that college students who exercise four to five times per week would have lower SPA scores. This hypothesis was supported for males only. Males who exercised 4-5 times a week had more physique anxiety than all other men and women who exercised moderately. Women who seldom exercised had the highest physique anxiety. Chu, Bushman & Woodard (2008) conducted a study examining the relationship between activity level, SPA score, and obligation to exercise among college students meeting the guidelines for American College of Sports Medicine. The obligation to exercise scores were the same for both women and men ($M= 43.0$, $p=.94$) indicating that men and women have similar levels of obligation to exercise (Chu et al., 2008, p.9). Results also revealed that "women with higher activity levels had higher obligation to exercise scores, but SPAS scores were similar to those of women with lower activity levels (Chu et al., 2008, p. 9)."

Nicholls Honors Program Establishes Service-learning Project to Conserve University- adopted Sculpture Site in the Coastal Community of Chauvin, LA

Mallory Robichaux and Gary LaFleur, Jr.[1], Deborah Cibelli[2], and Michael Williams[3]

[1]Mrobichaux27@its.nicholls.edu,
Gary.lafleur@nicholls.edu,
Department of Biology and the Center for Bayou Studies,
Nicholls State University

[2]Deborah.cibelli@nicholls.edu,
Department of Art and University Honors Program,
Nicholls State University

[3]Michael.Williams@nicholls.edu,
Department of Art and Chauvin Sculpture Garden,
Nicholls State University

ABSTRACT

The Chauvin Sculpture Garden was created by visionary artist Kenny Hill over a thirteen-year period in the late 1980s on the banks of Bayou Petit Caillou in Chauvin, LA. After Hill abruptly walked away from the site in 2000, the Kohler Foundation, located in Kohler, Wisconsin, purchased the land, restored the garden, and entrusted the site to Nicholls State University to maintain. Since then Nicholls has sought ways to integrate the garden into its educational initiatives. Here we describe a relationship created between the Nicholls Honors Program and the Chauvin Sculpture Garden that highlights service learning as a vehicle for student engagement and lasting community stewardship. Since 2015, the University Honors Program has logged nearly 240 person-hours in its efforts to provide labor and public awareness to the unique art installment. The project offers an opportunity for students to immerse themselves in the traditional Cajun community of Chauvin and expose themselves to unique folk art. Through the project, students are able to observe firsthand a geographical area impacted by climate change, creating a new generation of educated citizens able to work towards coastal protection and restoration. It also provides training in art conservation, using the work of Kenny Hill as a rare example of visionary art requiring interaction with conservators for its survival. As a result, we have found that the project nurtures a strong sense of connection to the Louisiana Coast as well as an opportunity to actively participate in the visionary work of Kenny Hill.

1. INTRODUCTION

The Chauvin Sculpture Garden is situated in a small plot of land along the bank of Bayou Petit Calliou in Chauvin, Louisiana, approximately 35 miles southeast of Nicholls State University. Nestled between two modest houses lining Highway 56, the Sculpture Garden could easily be missed by a driver passing through. However, the Chauvin Sculpture Garden is a hidden treasure awaiting discovery. More than 100 sculptures densely pack the narrow bayouside lot. The sculptures are primarily religious in theme, but all reflect the distinctive style of their creator,

Figure 1. A group of Nicholls faculty and Honors students gather at the Chauvin Sculpture Garden.

visionary folk artist Kenny Hill. The Chauvin Sculpture Garden is the only known major work of Hill, whose motives to create the Garden are still unknown. Hill arrived in Chauvin, Louisiana (population 3,400) in the late 1980's, and pitched a tent where the sculpture garden is located today. A bricklayer by trade, Hill built a small rustic home for himself over time. However, his little house was just the first of many creations Hill erected in that tiny plot on the bayou. Beginning in 1990, Hill began crafting what would eventually be a fascinating glimpse of the world through his eyes. Brick sidewalks weave through the sculptures, immersing the viewer in references that are historical, biblical, cosmological, psychological, and environmental in theme. Kenny Hill was truly a visionary artist, and masterfully transformed his lush bayou environment into something bordering on the supernatural. Almost as intriguing as the sculptures is the story of the artist who created them. In early 2000, Hill unexpectedly packed up his few belongings and left the site, never to return. Even today, the garden has a noticeably unfinished section the Hill abandoned. After he walked away, Hill denied any desire of affiliation with the Chauvin Sculpture Garden that he had created. The land the sculptures stood on soon faced the danger of repossession, and there was even discussion of disposing of the sculptures. Thankfully, a Nicholls art professor at the time, Dennis Sipiorski, contacted the Kohler Foundation, a philanthropic non-profit organization focused on art preservation based in Kohler, Wisconsin. The Kohler Foundation stepped in and purchased the land to save it from repossession and restore the garden. In 2002, the Kohler Foundation entrusted the site to Nicholls State University to maintain. Since then, various academics departments throughout the university have sought ways to contribute to the upkeep of the garden and integrate the garden into its educational initiatives. In 2014, a project was created that utilized students and faculty from various disciplines throughout the university via the University Honors Program. Since then, the service learning project has been refined into a successful long-term service learning relationship that teaches students about unique folk art, coastal erosion and the effects of climate change, and the culture of a traditional fishing community.

2. METHODS

Beginning in October 2014, the Nicholls Honors Program began taking groups of Honors Program students to the Chauvin Sculpture garden to provide upkeep of the garden and raise student awareness of the unique hidden garden located about an hour from the university. As the students look out the windows of the school bus transporting them to the garden, they begin to witness the lush greenery of the bayou, bait shops, and shimping boats. Upon arrival to the Sculpture Garden, the students are greeted by artist docents who look after the garden and give tours year round. The docents and faculty leaders of the project give students instructions as to what tasks the garden is in need of that day. Typically, students will clear dirt and grime from the sculptures, repaint the sculptures,

and maintain the foliage throughout the garden. Each visit lasts about 5-6 hours. As the students are laboring in the garden, an expert on the garden, whether that be one of the artist docents, Dr. Gary LaFleur, a professor in the biology department at Nicholls, or Dr. Deborah Cibelli, a professor in the art department at Nicholls, informally give students a history of the garden, tell the story of Kenny Hill, or talk about some other cultural or environmental issue affecting the garden. On the bus ride home, students further discuss the experience. The service learning project occurs twice a year- once in the fall semester, and then again in the spring semester as the garden prepares to host the annual Chauvin Folk Art Festival, in which the Nicholls community and community of Chauvin and the surrounding towns come together to celebrate the unique art installment.

Figure 2. Two Nicholls students repaint sculptured pathways created by Kenny Hill at the Chauvin Sculpture Garden in April, 2017.

3. RESULTS

Over the last three years, the Nicholls Honors Program has logged more than 240 person-hours working with the Chauvin Sculpture Garden. The Nicholls Honors Program and Chauvin Sculpture Garden have developed a symbiotic relationship in which Nicholls students and faculty assist in the conservation and upkeep of the Garden, which provides invaluable learning opportunities to those who participate. By visiting the Chauvin Sculpture Garden, the Honors students learn about unique fold art, traditional fishing communities, and coastal land loss. Students are able to directly interact with “one of the twelve most amazing sculpture gardens on Earth”, receiving commentary as the work by artists who are experts on the garden. Kenny Hill created a unique art installment in an area that few know about, let alone are able to experience as closely as the Nicholls Honors Program students. Additionally, students are exposed to the culture and landscape of Chauvin, a traditional Cajun community that maintains a strong connection to the resources of the wetlands. Chauvin is an area that is greatly affected by climate change and coastal land loss (Reed et al, 1996), and by visiting the garden biannually for several years, students are able to observe the effects of coastal land loss on a familiar site and realize the gravity of the ecological catastrophe facing Louisiana.

4. CONCLUSION

The relationship between the Nicholls Honors Program and the Chauvin Sculpture Garden is a prime example of service learning, since the activity is based upon the premise of reciprocal learning between students and the community. Since the initiation of the service learning project, the Nicholls State University community has become increasingly integrated into the community of Chauvin. The initial involvement with the Chauvin Sculpture Garden opened the door for Nicholls Student involvement in other local festivals, service initiatives, and community events. Each experience provides a unique opportunity for the student to gain in-depth knowledge with the coastal community of Chauvin and other similar rural towns, local Cajun culture and traditions, environmental awareness, and a diverse array of local elders to learn from. In the future, there is hope to delve further into the knowledge, experiences, and wisdom from some of the local elders met through working with the sculpture garden and interacting with the Chauvin community. Cecil Lapeyrouse, owner of a local bait shop and grocery store in Cocodrie, south of Chauvin, is one such example of someone who would be able to provide invaluable information in regards to cultural life along the bayous. If not for the service learning

relationship established between the Chauvin Sculpture Garden and Nicholls State University Honors program, connections such as this might never have been made. This relationship has the potential to be successful for a long time, because the sculpture garden benefits from the project by being consistently maintained and advocated for, and the Honors students are able to interact with highly-acclaimed folk art, a community rich in culture, and are exposed to an area in desperate need of coastal land loss protection and restoration. Through service learning at the Chauvin Sculpture Garden, Nicholls Honors Program students are actively involved in the power of preservation and conservation in a rich culture.

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Death Anxiety of a Loved One in a Cross-Cultural Study

Andre R. Rodriquez[1], Manyu Li[2], & Vaishali Sameer Mardhekar[3]
[1]Department of Psychology, University of Louisiana at Lafayette, arr4516@louisiana.edu
[2]Department of Psychology, University of Louisiana at Lafayette, manyu.li@louisiana.edu
[3]Modern College of Arts, Science and Commerce at Pune, India, vaism@rediffmail.com

ABSTRACT

India and the United States are cultures that sit on opposite sides of the world, thousands of miles apart. Though, diversity is ever present, especially so in the US, and these two cultures are able to coexist. It is important to consider the differences that may lie between the two cultures. This study aims to examine the relations between India and the US in the dimensions of interdependent-independent self-construal, holistic-analytic thinking style, and death anxiety of a loved one. The sample of this study included a total of 1183 university students. Among them, 624 (53%) were collected from a university in the southern US, and a comparable sample of 559 (47%) were collected from a college in Pune, India. Participants who agreed to participate were consented. The survey was conducted online in the US and online and paper-pencil in India because of the limitation of technologies available. Pearson correlation analyses showed that for both US and Indian samples, death anxiety of loved ones was positively correlated to interdependent self-construal (r_{india} = .13, p_{India} < .01; r_{US} = .09, p_{US} < .05). Results showed that the US sample experienced higher death anxiety of self and loved ones than the Indian sample. The US sample had higher independent self-construal, F (1, 1066) = 273.77, p < .001, but the two samples did not differ on interdependent self-construal. The US sample scored significantly higher on holistic thinking styles, F (1, 1066) = 100.69, p < .001, and lower on analytic thinking styles F (1, 1068) = 89.23, p < .001. Our findings suggested that culture has an influence upon death anxiety, particularly among interdependent thinking styles. It was also found that those students from India were higher in analytic thinking styles, and the US students were higher in holistic thinking.

Key Words: Death anxiety, independent self-construal, interdependent self-construal

1. INTRODUCTION

The United States, US, is home to a diverse population. As diversity is ever present within the US, a need for better understanding the differences and similarities of these coexisting cultures arises. The goal of this study is to analyze and compare cross-cultural independent-interdependent self-construal to death anxiety of a loved one among university students in India and the US.

Independent-interdependent self-construal is one of the cultural dimensions identified by Hofstede (Hofstede, 1980). Independent self-construal refers to one's view of self as separate from social roles or context. In other words, people with high independent-self hold a unique and independent view of self. Independent self-construal was found to be more common in western culture (Kafetsios, Hess, & Nezlek, 2017; Markus & Kitayama, 1991; Singelis, 1994). Interdependent self-construal refers to one's view of self as connected to social roles or context, and was found to be more common in eastern culture (Barlett et al., 2014; Markus & Kitayama, 1991; Singelis, 1994). Independent and interdependent self-construal are often measured

separately as two types of self-construal. It is suggested that an individual often has both independent self and interdependent self (Singelis, 1994).

Cultures are also differed based on the preferred cognitive styles (Nisbett et al., 2001). Fundamentally, there are two types of cognitive styles, namely, holistic and analytic thinking style. People with holistic thinking style tend to reason through association or interrelatedness of objects and the contextual meaning of the objects (Nisbett et al., 2001). People with analytic thinking style tend to reason attributes of individual object, with object detached from its context (Nisbett et al., 2001). According to Nisbett et al. (2001), people in independent culture use more analytic thinking style than holistic thinking style, while people in interdependent culture uses more holistic thinking style.

We hypothesized that the death anxiety of a loved one would positively correlate with higher interdependent self-construal scores, whereas those with higher scores of independent self-construal would have a lower death anxiety of a loved one. It was also hypothesized that the US would rank higher in independent self-construal and tend to be analytic thinkers, whereas India would rank higher in interdependent self-construal, as well as maintain a more holistic thinking style.

2. METHODS

2.1 Sample and Procedure

The sample of this study included a total of 1183 university students. Among them, 624 (53%) were collected from a university in the southern US, and a comparable sample of 559 (47%) were collected from a college in Pune, India. Participants who agreed to participate were consented. The survey was conducted online in the US and online and paper-pencil in India because of the limitation of technologies available. The mean age of the Indian sample is 20.41 (S.D. = 2.89), and the mean age of the US sample is 19.47 (S.D. = 2.88). In the Indian sample, 191 (38%) were males and 307 (62%) were females). In the US sample, 168 (29%) were males and 416 (71%) were females). Gender x Country was tested using independent chi-square test, $\chi 2$ (df = 1) = 11.01, $p < .001$. Age x Country was tested using ANOVA, F (1, 1077) = 25.35, $p < .001$.

2.2 Measures

Death Anxiety of loved ones and self. Death anxiety of others and self were measured using a 10-item shortened and revised scale from the classic Death Anxiety Scale (Nia et al., 2014; Templer, 1970). Respondents rated their anxiety on death based on a 5-point Likert-scale from 1 (strongly disagree) to 5 (strongly agree). Sample items included “I have nightmares about dying”, “The thought of death seldom enters my mind (reversed coded).”, and “I worry that I might die today”. The items were averaged to form a mean score. Cronbach alpha of the scale, .77, which showed that the scale had good reliability.

Independent-interdependent Self-construal. Participants’ independent and interdependent self-construal was measured using the shortened Singelis Self-construal Scale constructed (D’Amico & Scrima, 2016; Singelis, 1994). The scale consists of 18 items. Participants rate the items using a 7-point Likert scale from 1 (strongly disagree) to 7 (strongly agree). Sample items include “I enjoy being unique and different from others in many respects (Independent self)” and “I will sacrifice my self-interest for the benefit of the group I am in (interdependent self)”. Cronbach’s alpha for the independent self-construal scale was .65 and the

Cronbach alpha for the interdependent self-construal was .72. The Cronbach's alphas were consistent with previous studies (Singelis, 1994).

Analysis-Holism Scale. Analysis-Holism Scale was used to measure the cognitive styles of the participants. Research identified that analytical thinking is usually found in western cultures and holistic thinking style is usually found in eastern cultures (e.g. Fiske, Kitayama, Markus, & Nisbett, 1998). Analytic thinking style, as compared to holistic thinking style is the tendency to see parts rather than fields, consider internal disposition rather than relations among objects, perception of change as linear rather than cyclic, and choosing one over two opposite propositions rather than staying in the middle ground. This survey uses a shortened version of the Analysis-Holism Scale. Among the 12 items, sample items are "Everything in the universe is somehow related to each other (holism)", "It is more important to pay attention to the whole than its parts (holism)" and "Choosing a middle ground in an argument should be avoided (analysis)". Participants then rate the items from 1 (strongly disagree) to 7 (strongly agree). The items will be averaged to form a mean score.

3. ANALYSIS AND RESULTS

ANOVA was conducted to test cultural differences of death anxiety of loved ones, the cultural dimensions (i.e. independent-interdependent self-construal and analytic-holistic cognitive style), and death anxiety of self, controlling for age and gender. Assumptions of ANOVA were checked before the analyses were conducted. Results showed that the US sample experienced higher death anxiety of self and loved ones than the Indian sample. As hypothesized, US sample had higher independent self-construal, F (1, 1066) = 273.77, $p < .001$, but the two samples did not differ on interdependent self-construal. Contrary to our hypothesis, US sample scored significantly higher on holistic thinking styles, F (1, 1066) = 100.69, $p < .001$, and lower on analytic thinking styles F (1, 1068) = 89.23, $p < .001$.

As hypothesized, Pearson correlation analyses showed that for both US and Indian samples, death anxiety of loved ones was positively correlated to interdependent self-construal ($r_{india} = .13$, $p_{India} < .01$; $r_{US} = .09$, $p_{US} < .05$) and death anxiety of self ($r_{india} = .49$, $p_{India} < .001$; $r_{US} = .60$, $p_{US} < .001$). In the US sample but not in the Indian sample, death anxiety of loved ones was found to negatively correlate to independent self-construal ($r_{US} = -.10$, $p_{US} < .05$). Consistent to previous findings, in both countries, females showed higher death anxiety of loved ones ($r_{india} = .19$, $p_{India} < .001$; $r_{US} = .18$, $p_{US} < .05$) and higher death anxiety of self than males ($r_{india} = .14$, $p_{India} < .01$; $r_{US} = .23$, $p_{US} < .001$) in both countries.

4. DISCUSSION

Our findings showed that similar to classic east-west cultural studies, Indian university students had lower independent self-construal than university students in the US. However, contrary to analytic-holistic thinking style theory, Indians' thinking style was more analytic and less holistic than that of the US. Looking at correlations between cultural dimensions and death anxiety of loved ones, we found that interdependent self-construal is positively related to death anxiety of loved ones in both US and India.

The results of interdependent self-construal relating positively to death anxiety of loved ones in both the US and India were expected, as were Indian students having a lower independent self-construal than US students. What was not expected, though, was that Indian students thinking styles were more analytical than that of the students in the US. These unexpected findings may be due to geographical assumption, where we had expected Indian students to perform similar to other eastern cultures in comparison to a western culture, such as the US in comparison to East Asia, Indians' thinking style may be more similar to the US than

anticipated. Though, it is hard to generalize these findings as the sample was relatively small, and taken solely from university populations, to which only a single university population was pulled from each, the US and India. Future studies may aim to use a larger sample from a broader population than sampling solely university students, which would likely show more accurate results on a larger, more generalized scale.

Table 1.

	India (N=559)	US (N=624)
	N (%)	N (%)
Male	191 (38%)	168 (29%)
Female	307 (62%)	416 (71%)
	M (S.D.)	M (S.D.)
Age***	20.41 (2.89)	19.47 (2.88)

*$p < .05$, **$p < .01$, ***$p < .001$. Gender x Country was tested using independent chi-square test, $\chi 2$ (df = 1) = 11.01, $p < .001$. Age x Country was tested using ANOVA, F (1, 1077) = 25.35, $p < .001$.

Table 2. Means and standard deviations of death anxiety of loved ones, independent-interdependent self-construal, analytic-holistic cognitive style and death anxiety of self, compared across cultures by using ANOVAs.

	India N = 559	US N = 624			
Tested variables (scale range)	Mean (S.D.)	Mean (S.D.)	df (between, within)	F	p
Death anxiety of loved ones (1-5)***	3.02 (.62)	3.41 (.73)	1, 1059	64.92	.000
Holistic thinking style (1-7)***	4.47 (1.07)	5.42 (.82)	1, 1066	100.69	.000
Analytic thinking style (1-7)***	4.82 (.84)	4.34 (.95)	1, 1068	89.23	.000
Independent self-construal (1-7)*	4.73 (.90)	4.91 (1.00)	1, 1066	273.77	.000
Interdependent self-construal (1-7)	4.62 (.79)	4.57 (.84)	1, 1064	1.90	.169
Death anxiety (1-5)***	2.72 (.58)	3.10 (.71)	1, 1065	169.35	.000

*p < .05, **p < .01, ***p < .001. Multiple one-way ANOVAs were conducted to test the mean differences across cultures (India vs. US).

Table 3. Overall correlations among tested variable and correlations by country. Correlations of the variables among US sample (N = 624) is shown in the lower half of the table, correlations of the variables among Indian sample (N = 559) is shown in the upper half of the table.

	Indian sample (N = 559)							
US Sample (N = 624)	DAL	HOL	ANA	IND	INT	DA	AGE	GENDER
1. Death anxiety of loved ones (DAL)	-	.01	.01	-.02	.13**	.49***	.00	.19***
2. Holistic (HOL)	.12**	-	-.50	.12**	.18***	-.03	.06	.18***
3. Analytic (ANA)	.06	-.10*	-	-.06	-.09*	-.05	-.12**	.00
4. Independent (IND)	-.10*	.34***	-.26***	-	.23***	-.14***	-.03	.04
5. Interdependent (INT)	.09*	.34**	-.27***	.20***	-	.09*	-.05	.07
6. Death anxiety (DA)	.60***	.01	.07	-.20***	.09*	-	.02	.14**
7. Age	-.07	.04	.05	.09	-.13*	-.12**	-	-.13**
8. Gender (1=Male; 2=Female)	.18***	.13**	.04	-.01	-.02	.23***	-.03	-

*p < .05, **p < .01, ***p < .001.

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The Impact of Social Reactions, Adaptive Coping Styles, and Optimism on Levels of Posttraumatic Growth Following an Unwanted Sexual Experience

Melanie Schanke[1], Amy Brown, PhD[2]
[1]University of Louisiana at Lafayette, mrs0781@louisiana.edu
[2]University of Louisiana at Lafayette, alb6095@louisiana.edu

ABSTRACT

Sexual assault is a major public concern due to the poor psychological and physical outcomes. One in five adult women will experience sexual assault during her lifetime (Black et al., 2011). The violent nature of the experience and severe trauma that follows sexual violence may explain why minimal research has been given to possibility of growth. Tedeschi and Calhoun (1996) first introduced the idea of posttraumatic growth, the positive psychological outcomes victims experience after rebuilding their assumptions about oneself, others, and the world following the destruction of beliefs through a traumatic experience. Important aspects of life such as relationships with others, appreciation of life, spirituality, new possibilities, and personal strength will improve beyond a person's previous state through posttraumatic growth (Tedeschi & Calhoun, 1996). Frazier (2001) first studied specific patterns and timing of posttraumatic growth in sexual assault victims; over time positive life changes increased as negative life changes decreased. As early as two weeks, victims can experience posttraumatic growth. It was found that social support, approach and religious coping, and perceived control over the recovery process were all related to higher levels of posttraumatic growth (Frazier, 2004). Benight and Bandura (2004) found dispositional optimism can lead to greater posttraumatic growth following a sexual assault by effectively using adaptive coping strategies (religious, acceptance, and reappraisal) in attempt to maintain an expectation of positive outcomes. Specifically, positive religious coping following a sexual assault has been found to be related to higher levels of psychological well-being and lower levels of depression (Ahrens, Abeling, Ahmad, & Hinman, 2010). Ullman (2014) found that negative social reactions, greater symptoms of PTSD, maladaptive coping strategies, and characterological self-blame were related to lower levels of posttraumatic growth.

1. INTRODUCTION

Society's social stigma surrounding victims of sexual violence often leads to negative social reactions following disclosure. Many victims experience shame and self-blame from negative social reactions (Littleton & Breitkopf, 2006; Ullman & Najdowski, 2011; DeCou, Cole, Lynch, Wong, Matthews, 2017). Such negative reactions are likely to enhance psychopathology (DeCou, Cole, Lynch, Wong, Matthews, 2017) which can ultimately inhibit a victim from exploring positive outcomes. However, little is known if well-developed positive factors can reduce the negative effects of social reactions. The purpose of the study is to examine if adaptive coping styles and dispositional optimism can buffer the experience of negative social reactions and lead to similar levels of posttraumatic growth in victims who do not experience negative social reactions.

2. METHODS

Participants were female students recruited through SONA, which is an online experiment participation platform used to recruit introductory psychology students. The online questionnaire consists of several different measures. Participants will first fill out demographic information. The first measure is the Sexual Experiences Survey – Short Form Victimization (Koss et al., 2006). This questionnaire assesses victimization of unwanted sexual experiences. It measures the prevalence of specific sexual victimization forms; non-victim, sexual contact, attempted coercion, coercion, attempted rape, and rape. The primary aim is to examine the frequency of each unwanted sex act and the how often each specific tactic was used. The next measure is the Social Reactions Questionnaire which contains 47 items. The SRQ measures the negative social reactions and positive social support from formal and informal support groups following the disclosure of a sexual assault. It is theorized that there are two positive subscales; emotional support and tangible aid. The subscales of distraction, treat differently, take control, victim blame, and egocentric have been theorized to be negative social reactions (Ullman, 2000). Next, the COPE measure contains 60 items that measures coping styles (Carver, Scheier, and Weintraub, 1989). For the purpose of this study, only 8 items were used which measured acceptance coping and positive reinterpretation and growth. The brief form of the RCOPE contains 14 items and measures the use of religious coping following stressful life events (Pargament, Feuille, and Burdzy, 2011). The Life Orientation Test – Revised measure consists of 10 items (Scheier, Carver, and Bridges, 1994). LOT-R measures levels of optimism versus pessimism. The next measure is the PCL-C which contains 17 items and examines levels of posttraumatic stress disorder (Weathers, Litz, Huska, & Keane, 2013). The final measure is the short form of the posttraumatic growth inventory (Cann et al., 2010). This measure examines various positive outcomes following a traumatic event.

3. RESULTS

The purpose of this study was to examine the interaction of positive and negative social reactions with optimism and coping styles on levels of posttraumatic growth for individuals who have experienced an unwanted sexual experience. Of the 201 participants, 118 have experienced an unwanted sexual experience. An unwanted sexual experience includes attempted or completed sexual contact, oral, vaginal, or anal rape. Of these participants, 79 have experienced a completed rape while 39 have experienced an attempted rape. Our study included the seven subscales to the SRQ; emotional support (M= 4.23), distraction (M= 2.68), treat differently (M= 2.10), take control (M= 2.65), tangible aid (M= 2.29), victim blame (M= 3.34), and egocentric (M= 2.57). There was a positive correlation between posttraumatic growth and posttraumatic distress (b=.34, t= 3.11, p= 0.023). It was found that posttraumatic growth had a positive correlation with both emotional support (b= .4, t=1.95, p= 0.0572) and tangible aid (b= .37, t= 2.37, p= .021). Multiple regression was used to examine main effects and interactions of levels of growth, distress, social reactions, adaptive coping (acceptance and positive reinterpretation), and optimism. The relationship of distress and posttraumatic growth was moderated by optimism (b= .44, t= 2.31, p= 0.022*) and emotional support (b= .59, t =2.52, p= 0.02). It was found that optimism moderated the negative relationship between victim blame and PTG (b= -1.34, t= -2.74, p= 0.0088). Furthermore, emotional support moderated the negative relationship of posttraumatic growth and taking control (b= -0.47, t= -1.94, p= 0.058).

4. DISCUSSION

While our study did not find any significant results for adaptive coping styles and PTG, there were meaningful results in regards to social support and perspective outlook. Being that higher levels of distress significantly predicted higher levels of posttraumatic growth, it is possible that experiences of distress can motivate an individual to experience more positive outcomes. A stronger correlation was found when emotional support or optimism were moderators to this relationship. A more positive outlook on life may be useful for an individual who is experiencing symptoms of PTSD. Such optimism can better promote a desire to overcome and grow from their negative experiences. Being that emotional support has the highest mean score (M= 4.23), it can be pivotal in the healing process following an unwanted sexual experience. Emotional support can further motivate an individual to overcome distress, ultimately leading to greater levels of PTG. It is believed that emotional support moderates the negative correlation between PTG and the social reaction, taking control. Perhaps, this further supports the importance of a positive social support group. Peers who do not attempt to control the victim's decisions or perspective are also successful at providing emotional support, thus, leading to higher levels of PTG. it is believed that optimism moderates the negative social reaction, victim blame, which commonly occurs among victims of sexual assault. Although it was not hypothesized that positive social reactions could buffer the experience of negative social reactions and lead to greater growth, results showed the importance of a positive social support group following sexual assault. While it is evident that victims of unwanted sexual encounters experience both positive and negative social reactions, a strong support group and optimistic outlook may be beneficial in the recovery process.

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Using Markov Chains to Estimate Student Success in Changing Majors

Pankaj Sherchan[1], Deep Sagar Karki[2] and Dr. Lucyna Kabza[3]
[1]47 Joe Iverstine, Hammond, LA,70401, Southeastern Louisiana University,
pankaj.sherchan@selu.edu
[2]17520A Tangi lakes Dr, Hammond, LA, 70403, Southeastern Louisiana University,
deep.karki@selu.edu
[3]316D Fayard Hall, Hammond, LA, 70401, Southeastern Louisiana University,
lkabza@selu.edu

ABSTRACT

Most college students have dilemmas about choosing the right major. The confusion grows every year with the increasing number of options. 50% to 70% of students are most likely to change their major once. Most will change at least 3 times before they graduate. The truth is that more than 50% of college graduates pursue careers that are not related to their majors. The reason for attending college for them is just to get a degree. Thus, there is an urgent need for a way to solve this issue. We use stochastic modelling with Markov Chains to estimate the probability of success of changing majors.

Key Words: Markov Chains, Bayes' Theorem, Transition probability matrix.

1. PROCEDURE

We use the stochastic modelling with Markov chains. A Markov chain is a type of stochastic process that has either a discrete state space or discrete index set representing time. Markov processes are called "memoryless" as one can make the prediction of the future solely based on the current state. The past history of the process is ignored. We are concerned with the discrete-time Markov chain, where moving to next state depends only upon the present state. For instance, $Pr\,(X_1 = x_1, X_2 = x_2, \ldots\ldots, X_i = x_i) = Pr\,(X_{i+1} = x | X_i = x_i)$. Here X_i represents the state where $i \in \{1, 2, 3 \ldots\ldots N\}$. In this case our states are majors of the students and N represents the total number of majors. We then form the "*probability transition matrix*" or "*state transition matrix*", which describes the transition of a Markov chain.

For this purpose, we collected two semesters of data (Fall 2016 & Spring 2017) for students who changed their majors at Southeastern Louisiana University. We verified that nearly 60% students changed their major during their academic life in Southeastern. Since we needed to decide the success of changing majors, this transition matrix was not of much help. So, we divided a specific major into two categories:

a) Low GPA
b) High GPA

With the division of the major, we defined the success and failures that supports the purpose of our study:

a) Low GPA → High GPA (Success)
b) High GPA →High GPA (Success)

c) Low GPA → Low GPA (Failure)
d) High GPA → Low GPA (Failure)

However, we also observed that this transition matrix was misleading since we did not account for grade level (Freshman, Sophomore, Junior, Senior). The number of students changing majors in freshman year is obviously different than in senior year and so on. We then furthermore divided the total number of students into 4 classifications and recalculated the transition matrix for each classification. We used the Bayes theorem to calculate the overall success of changing from one major to another during their academic year.

Our results should help to analyze the success of students over the course of their academic years. This will help in advising students to choose right major for the graduation. Additionally, the results should also be helpful to the departments in predicting the number of majors and the number of students leaving the major and entering the major.

Synthesis and Characterization of Titanium Dioxide (TiO_2) -Ethylenedioxythiophene Nanocomposites

M. G. Torres[1], A. Shield[2], K.V. Hernandez[3], P.L. Stephan Thamban[4], A.V. Walker[5], M. J. Goeckner[6], and Jafar F. Al Sharab[7]

[1]Department of Materials Science and Engineering, University of Texas at Dallas, 800 W. Campbell Drive, RL 10, Richardson, TX 75080

[2]Department of Engineering Technology, Northwestern State University, Natchitoches, LA 71497, ashield031362@nsula.edu

[3]Department of Materials Science and Engineering, University of Texas at Dallas, 800 W. Campbell Drive, RL 10, Richardson, TX 75080

[4]Department of Materials Science and Engineering, University of Texas at Dallas, 800 W. Campbell Drive, RL 10, Richardson, TX 75080

[5]Department of Materials Science and Engineering, University of Texas at Dallas, 800 W. Campbell Drive, RL 10, Richardson, TX 75080, Amy.walker@utdallas.edu

[6]Department of Materials Science and Engineering, University of Texas at Dallas, 800 W. Campbell Drive, RL 10, Richardson, TX 75080

[2]Department of Engineering Technology, Northwestern State University, Natchitoches, LA 71497, jafar@nsula.edu

ABSTRACT

Poly (3,4-ethylenedioxythiophene)s are conducting polymers which are receiving great attention recently due to their prospects in the field of bioelectronics, and flexible electronics. These polymers exhibit a combination of characteristics which includes conductivity, stability, transparency and biocompatibility. Polymerized 3, 4-ethylenedioxythiophene, PEDOT, is a transparent, conductive polymer that is widely used in organic electronics (Mantione, del Agua, Sanchez-Sanchez, & Mecerreyes, 2017). Numerous researchers have studied novel methods to deposit PEDOT because of desire to improve organic electronics (Malliaras & Abidian, 2015). While PEDOT is typically produced using traditional solution and gas-phase polymerization techniques, a number of researchers have also examined the production of a polymer-like films via plasma polymerized EDOT (Quan, Joo, & Jung 1999).

In this research, the incorporation of titanium dioxide (TiO_2) nano-particles into plasma polymerized EDOT has been examined in order to assess its impact on the electrical conductivity and mechanical properties of thin films. The investigators have developed a method of inserting the TiO_2 nano-particles into the PEDOT plasma. The setup consists of a “shaker” like device, Figure 1, which is similar to how laboratory “dusty plasmas” are created for the study of space plasmas. All films were deposited on silicon substrate in vacuum. The processing was carried out in a stainless steel chamber with vacuum level ranging from 20 to 40.6 mTorr at 88°C. The pulsed inductively coupled plasma gun operated at 100Hz. These conditions ensure a power of ~4watts is achieved. The resulting films were examined with and without the nanoparticles. Several characterization techniques were used to correlate processing/structure with properties.

The TiO_2 Nano particles were incorporated using “dusty plasma”. All samples were collected on Silicon Substrate. “Dusty plasmas” are ionized gases containing nanoparticle which become electrically charged by the interaction with plasmas. This charge in the particles is due to the collection of electrons and flowing ions. Since the electrons move faster than the positive ions, the particles collect the electrons first, gaining a negative charge. To repel the

collection of electrons and collect the positive ions a balance of the net current must be achieved.

All collected samples were deposited in a Pulsed Inductively Coupled Plasma chamber operating at pressure of 20 mTorr- 40.6mTorr, Figure 2. Temperature of EDOT was 88°C. Pulse Frequency of the plasma gun was 100 Hz. Approximate power of the system with the said conditions was 4 Watts, and Run Time was 25 min. Details on deposition conditions and results can be found somewhere else (Shield et al., 2017).

Detailed characterization techniques such as X-ray photoelectron spectroscopy (XPS), Scanning Electron Microscopy (SEM), and Transmission Electron Microscopy (TEM) will be employed to compare the experimental results of the deposited thin films. These techniques have the resolution capability to observe any chemical and structural differences. Hence precise quantitative analysis will provide solid answers on the influence of nano-particles on the surface growth.

Fig. 1. Dust shaker equipment used to introduce TiO_2 Nanoparticles

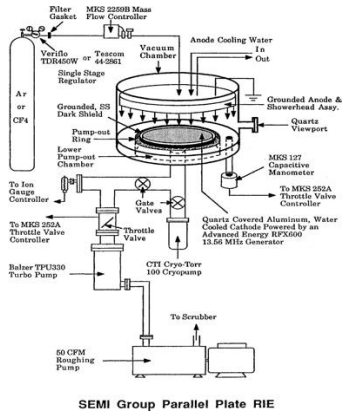

Fig. 2. Schematic showing the pulsed inductively coupled plasma chamber used in this research.

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The Ups and Downs of Death-Related Language

Austin Simoneaux[1], Mateja Pavlic[2], Brooke Breaux[3], Reagan Thompson[4], Miranda Bowling[5], and Alyssa Lacour[6], Tristen Morvant[7], and Jordan McKendall[8]

[1]Austin Simoneaux, University of Louisiana at Lafayette, aps7780@louisiana.edu
[2]Mateja Pavlic, University of Louisiana at Lafayette, mxp1503@louisiana.edu
[3]Brooke Breaux, University of Louisiana at Lafayette, brookebreaux@louisiana.edu
[4]Reagan Thompson, University of Louisiana at Lafayette, rbt8359@louisiana.edu
[5]Miranda Bowling, University of Louisiana at Lafayette, mxb7226@louisiana.edu
[6]Alyssa Lacour, University of Louisiana at Lafayette, akl1209@louisiana.edu
[7]Tristen Morvant, University of Louisiana at Lafayette, trm4836@louisiana.edu
[8]Jordan McKendall, University of Louisiana Lafayette, jam7893@louisiana.edu

ABSTRACT

Previous research suggests that the distinction between positive and negative death-related metaphors can provide insight into people's unconscious opinions about death (e.g., McLennan et al., 1997). The current study was designed to further investigate these claims using figurative, death-related phrases commonly found in everyday language: for example, *went to Heaven*, *watching over us*, *laid down his life*, *six feet under*. Eighty-five students from the University of Louisiana at Lafayette rated a series of figurative statements according to their valence (positive vs. negative), direction (up vs. down), and topic (death vs. other). These participants also completed Templer's (1970) Death Anxiety Questionnaire and MacDonald's (2000) Expressions of Spirituality Inventory – Revised. The assumption was that participants would be able to accurately categorize these statements but that that death anxiety and spirituality might systematically alter their ratings. More specifically, we predicted that higher death anxiety would lead to more negative assessments of death-related statements. We also predicted that higher degrees of spirituality would be associated with lower death anxiety. Our findings suggest that individual differences, such as death anxiety and spirituality, do not play a significant role in participants' ratings of direction, valence, and topic. What does seem to matter is the tendency for positive ratings to be associated with upward movement or location and negative ratings to be associated with downward movement or location. These findings are in line with the conceptual metaphors GOOD IS UP and BAD IS DOWN (Lakoff & Johnson, 1980), which has been used to investigate the relationship between word meaning and motor action. For example, Casasanto and Dijkstra (2010) have found that retrieval of emotional autobiographical memories can be influenced by something as simple as moving marbles from a lower bin to a higher bin. We are currently exploring whether similar patterns can be observed for death-related language.

Key Words: language, psychology, metaphor, death.

1. INTRODUCTION

Researchers such as Jim McLennan and his colleagues (e.g., McLennan, Bates, Johnson, Lavery, & Horne, 1993; McLennan et al., 1997) have noted several distinctions between positive and negative metaphors about death. They developed a Death Fantasy Scale (DFS) in which positive metaphors about death (e.g., death as a homecoming, peaceful garden, great adventure) and negative metaphors about death (e.g., a cold lonely journey, a high stone wall, a fall from a cliff) are used to measure participants' unconscious opinions about death. Interestingly, these researchers found that those participants who identified more with negative

metaphors were more likely to have higher anxiety about death (McLennan et al., 1997) and that those participants who identified more with positive metaphors were more likely to have thought about death (McLennan et al., 1993). Furthermore, the researchers found that religious students were more likely to identify with positive metaphors and less likely to identify with negative metaphors as compared to nonreligious students (McLennan et al., 1997).
Similar to McLennan and his colleagues, we are interested in death-related metaphors, but instead of the general metaphorical conceptualizations studied by McLennan and his colleagues, we are interested in figurative language that occurs in everyday language. Think about when a family member calls to say that grandmother *went to Heaven* or when a solider is said to have *laid down his life*. Notice how these death-related phrases seem to imply upward or downward movement and seem to be either positive or negative. We hypothesized that these distinctions could be easily recognized by others; however, we also thought that people's responses to death-related language could be influenced by their degree of death anxiety and their degree of spirituality. More specifically, we predicted that higher death anxiety would lead to more negative assessments of death-related statements. We also predicted that higher degrees of spirituality would be associated with lower death anxiety.

2. METHOD

2.1. Participants

Eighty-five students (60 females and 25 males) from the University of Louisiana at Lafayette participated. Participants were enrolled in at least one psychology course and were recruited through SonaSystems. Students earned credit in their psychology course in exchange for their participation. On average, participants were 19 years old (*SD* = 1.5). Over half (68.2%) of the participants were Caucasian. The majority (98.8%) were native English speakers.

2.2. Materials

We created eight categories of statements based on (a) whether or not there was a direction or location implied in the statement (i.e., up, down, or neither), (b) whether the statement was considered positive or negative, and (c) whether or not the statement was related to death. This resulted in a total of 88 statements.

2.3. Procedure

First, participants provided their informed consent and were then asked a series of demographic questions. Then each participant was seated in front of a computer and provided a set of headphones. Each participant listened to 44 statements and, for each statement, were asked to type what they heard then rate (a) the degree to which they associate the statement with a vertical direction or location (Direction: 1- involves downward movement or a relatively low location to 7- involves very clear upward movement or a relatively high location), (b) the degree to which they consider the statement to be positive or negative (Valence: 1- is extremely negative and makes me feel very unhappy, annoyed, unsatisfied, melancholic, despaired, or bored to 7- is extremely positive and makes me feel very happy, pleased, satisfied, contented, hopeful), and (c) the degree to which they think the statement is related to death or dying (Topic: 1- is in no way related to death and dying to 7- is definitely related to death and dying). Participants were then asked to provide a brief interpretation of the statement.
Finally, participants completed the Death Anxiety Questionnaire (DAS; Templer, 1970) and the Expressions of Spirituality Inventory – Revised (ESI-R; MacDonald, 2000). After completing these questionnaires, participants were told about the purpose of the research.

3. RESULTS

Before data analysis, 20 participants were removed from Version 1 (11 due to experimenter error and 9 due to non-completion) and four from Version 2 (all due to non-completion). Direction, Valence, and Topic ratings were removed from further analysis when participants either incorrectly transcribed or misinterpreted the statement. Three separate hypotheses were addressed in this analysis.

3.1. Hypothesis 1

We hypothesized that participants' ratings would be influenced by their degree of death anxiety and their degree of spirituality. This hypothesis was supported by two multiple regression analyses: one predicting the Valence ratings of positive statements and one predicting the Valence ratings of negative statements. We wanted to determine if any of the following were significant predictors of these two variables: direction or topic ratings, the five ESI-R subscales, and the DAS. Only ratings of direction were a significant predictor of positive phrase valence ratings, $X^2(1, N = 60) = 38.16$, $p < 0.001$, such that positive phrase ratings were associated with scores of upward movement or location and negative ratings were associated with downward movement or location. Another potential predictor was the religious subscale of ESI-R, $X^2(1, N = 60)$ 3.07, p = 0.080. Similarly, only ratings of direction were a significant predictor of negative valence ratings, $X^2(1, N = 60) = 17.15$, $p < 0.001$. Again, positive ratings were associated with upward movement or location and negative ratings were associated with downward movement or location. Another potential predictor was the Topic ratings, $X^2(1, N = 60) = 3.77$, $p = 0.052$.

3.2. Hypothesis 2

We also predicted that higher death anxiety would lead to more negative ratings for death-related statements; however, the correlation between DAS scores and valence ratings for death related statements was not significant.

3.3. Hypothesis 3

We also predicted that higher degrees of spirituality would be associated with lower death anxiety. Correlations between DAS scores and all of the subscales of the ESI were calculated, and only one subscale, Existential, showed a significant correlation with DAS scores, $r(58) = -0.46$, $p < .001$.

4. DISCUSSION

Although individual differences, such as death anxiety and spirituality, did not consistently play a significant role in participants' ratings of direction, valence, and topic, we did find that death anxiety is correlated with the Existential subscale of the Expressions of Spirituality Inventory – Revised. This pattern of results suggests that these assessments tap into the same construct, and this relationship deserves further investigation.

Interestingly, valence ratings in response to positive and negative statements both revealed significant effects involving direction: more positive ratings were associated with upward movement or location and more negative ratings were associated with downward movement or location. Previous research has shown that emotion and motor action can interact (e.g., Casasanto & Dijkstra, 2010; Casasanto & Lozano, 2007). For example, Casasanto and Dijkstra (2010) have shown that retrieval of emotional autobiographical memories can be influenced by something as simple as moving marbles from a lower bin to a higher bin. Very generally, these researchers found that "positive emotions are implicitly associated with upward movements and

negative emotions with downward movements" (p. 182); however, to our knowledge no one has explored the relationship between motor movements and death-related statements. These preliminary findings are in line with previous research, suggesting that the processing of figurative, death-related language may involve activation of the conceptual metaphors GOOD IS UP and BAD IS DOWN (Lakoff & Johnson, 1980).

We think this is an important area of research and that results from these studies could be used to inform clinical practices with bereaved patients. We are currently expanding upon this research by investigating the degree to which implied direction and valence in figurative statements have an impact on motor movements and, conversely, the degree to which motor movements have an impact on memory for figurative statements.

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An Automated Gentle Handling System for Sleep Restriction in Sprague Dawley Rats

Caitlin D. Snell[1], Francois Decuir[2], and Bryant C. Hollins[3,4]

[1]Department of Biomedical Engineering, Louisiana Tech University, Ruston, LA, 71272, caitlindsnell@gmail.com

[2]Department of Biomedical Engineering, Louisiana Tech University, Ruston, LA, 71272, fde002@latech.edu

[3]Department of Biomedical Engineering, Louisiana Tech University, Ruston, LA, 71272

[4]Center for Biomedical Engineering and Rehabilitative Sciences, Louisiana Tech University, Ruston, LA 71272, bhollins@latech.edu

ABSTRACT

Why animals sleep remains a question of intense research interest in biology. While it is well-known that sleep is a necessary and beneficial activity for animals, and the detrimental consequences of sleep restriction, including metabolic changes and cognitive dysfunction, are well-characterized, the field does not yet understand why sleep itself is necessary from a biochemical perspective. Part of this challenge lies in having robust, reproducible methods for disrupting sleep in animals that is consistent between researchers and laboratories. In this project, our group is trying to develop an automated gentle handling sleep restriction method for Sprague Dawley rats. We engineer our system to expose the rat to an external stimulus (a tap on the rat cage) in order to disrupt its sleep. In this project, we will vary the pattern and frequency of the stimulus to optimize system effectiveness at sleep restriction. We use video recording and image analysis using an in-house written MATLAB code. The long-term goal is to develop a method that is capable of continuous sleep restriction of the animal for 24 hours. This project will introduce an automated, highly reproducible, and robust procedure that can be the first step in comprehensive biochemical studies of the brain during sleep restriction.

1. INTRODUCTION

The Centers for Disease Control and Prevention (2014) declared sleep restriction to be a “public health epidemic”. Understanding the neuroscience of sleep restriction, with regards to biochemical pathways, will reveal insight into potential interventions to preserve cognitive function during sleep restriction, particularly in occupations such as emergency room professionals, first responders, and the military, where sharp cognitive abilities are required in potentially sleep-restrictive environments. There are two primary challenges to investigating the neurochemistry of sleep restriction. First, limited accessibility to the internal biochemistry and physiology of normal human brains under sleep restriction conditions necessitate the use of animal models, but a common controversy in science has been the translatability of animal model results to human studies. Weljie et al. (2015) found two chemical compounds that responded similarly in both humans and Sprague-Dawley rats following sleep restriction, providing the first evidence of potential biochemical sleep debt commonality across species. This study accomplished much in terms of addressing the first challenge. The second challenge, which is perhaps more significant in terms of obtaining reliable scientific results, is the high variability present between sleep studies. There are two primary methods used for total sleep deprivation, the “gentle handling” method and the disk-over-water (DOW) method (Colavito, 2013). Gentle handling requires a researcher

actively disrupting sleep for an animal, often through a poke-like stimulus. The issues with this approach include the animal becoming acclimated to the stimulus and lack of regulation on the stimulus intensity, frequency, and duration, making inter- and intra-lab measurements highly variable. The second approach is the automated DOW method, which overcomes the reproducibility and acclimation challenges of the gentle handling method, but also has significant drawbacks, including expensive system setup costs and proprietary software that requires significant apprenticeship to use. Therefore, the method cannot be universally adopted by the research field for investigating the neurochemistry of sleep restriction.

In this project, our group is trying to develop an automated gentle handling sleep restriction method for Sprague Dawley rats. We engineer our system to expose the rat to an external stimulus (a tap on the rat cage) in order to disrupt its sleep. We have demonstrated the system has the potential to disrupt sleep for an animal, but the animal acclimates to the stimulus before the end of the experimental time period. The long-term goal is to develop a method that is capable of continuous sleep restriction of the animal for 24 hours.

2. METHODS

We will use the Sprague-Dawley rat model commercially available from Harlan. These animals are maintained on a 12-hour light/dark cycle at the Animal Care Facility on the campus of Louisiana Tech University and they are allowed ad libitum access to food and water. All protocols have been approved by the Louisiana Tech Institutional Animal Care and Use Committee.

For testing our method, animals are maintained in their home cage and moved to an experimental room. The animal's cage is placed on a table against a black wall in order to provide a strong contrast of the animal and its environment on our video. We expose the animals to an external stimulus, a strike on the side of a housing cage, using a plastic bar attached to a servo, as shown in Figure 1. The servo is controlled by an Arduino processor.

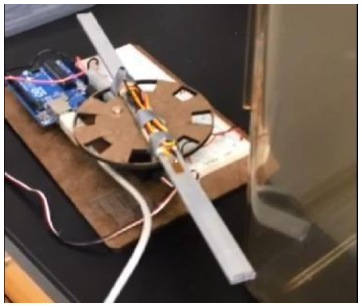

Figure 1. The stimulus system used to complete gentle handling studies. The servo, attached to a programmed Arduino, strikes the rat cage (on right of image) at a frequency specified by the program.

This study is conducted for 24 hours at a time, and we record a video of the animal's response to the stimulus for post-hoc quantitative analysis. We will alter the pattern and frequency of the stimulus, as shown in **Figure 2**. The versatility of the Arduino allows us to change frequency and pattern by adjusting parameters within the program in an easy and quick manner, reducing the burden on researchers using the method.

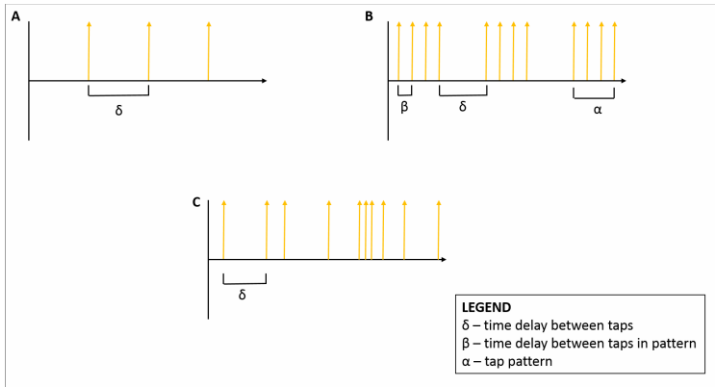

Figure 2. The striking stimulus pattern used to sleep restrict rats. The program can be easily adjusted to alter the pattern, frequency, and time between striking the cage.

3. RESULTS AND DISCUSSION

This project is still in its early phases. We have been able to successfully set up the animal in its testing environment and have exposed to animal to an external stimulus similar to the pattern shown in **Figure 2(A)**, with a striking frequency of 10 seconds over a 24 hour period. The first response that we are interested in analyzing is stimulus acclimation, or how long it takes the animal to stop responding to the stimulus. We observed the animal initially respond to the stimulus (the animal noticeably flinched as the bar struck the cage). However, after a period of time, the animal stopped reacting to the stimulus, suggesting the animal became acclimated to the method. We are analyzing the video data to determine how long the animal takes to acclimate to this stimulus pattern. In developing a system to disrupt sleep, acclimation is a key factor for consideration.

When we ran this study for the first time, the servo in our system became disconnected after a period of operation, suggesting a need to redesign the system to prevent this. We did a redesign of the wires to allow for more slack and we repeated the study with the same animal. In this study, the animal did not seem to respond to the stimulus at all, providing an indication that the stimulus pattern of a single tap at a constant frequency may not be effective for sleep restricting an animal more than once, introducing additional variables we need to consider. We will use the video analysis to quantify these results and provide a basis for comparing the effectiveness of the stimulus patterns seen in Figure 1. We are developing an in-house MATLAB program that will be able to measure the animal's movement in response to the stimulus, which we will be able to use to quantify system effectiveness.

4. CONCLUSION

The need for understanding the biochemical mechanisms of cognitive decline in sleep deprivation is critical for developing treatment strategies to reduce the dysfunction, particularly in high-demand service fields like emergency departments and first responders. The successful development of our method, an automated gentle handling approach for sleep restriction, would allow for consistent results across sleep laboratories. In addition, the method as designed is simple, easy to implement, and is compatible with down-stream cognitive testing, such as novel object recognition, Water Morris Maze, and open-field testing, and it can be incorporated into behavioral testing paradigms fairly easily. Lastly, the method does not involve the use of any types of chemicals to restrict sleep; therefore, it is expected that no biochemical changes will occur in

the system as a result of the method. This method will introduce a way to translate sleep results between multiple labs and increase the reproducibility and quality of the data obtained in sleep-related animal studies.

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Through the Eyes of a Millennial: Millennial Perceptions of Entitlement

Courtney Suire
P.O. Box 43570, Lafayette, LA 70504-3570, University of Louisiana at Lafayette,
cas0101@louisianan.edu

ABSTRACT

Within the last decade alone, the research community has gained great interest in the Millennial Generation, particularly in regard to their level of entitlement. While existing studies have sought to discover how this most recent generation should be expected to fit in with society in a number of ways, few have ventured to understand exactly what entitlement means to Millennials. An exploratory studied was performed to unearth how Millennials conceptualize the idea of entitlement for themselves, and what themes they feel they are most entitled to in three situational categories: College, Work, and Life. After developing a qualitative survey, frequency results were analyzed to discover which entitlement themes occurred most often in each situational category. Findings provide a basis for future explorations in research in regards to entitlement differences among generations, differences in entitled attitudes across demographic categories, as well as what ultimately causes entitlement.

Key Words: Entitlement, Millennials, Perceptions

1. INTRODUCTION

In general, there is a consensus among adults, young and old, that Millennials possess a robust but unhealthy sense of entitlement. Merriam-Webster (2017) defines this attitude as a "belief that one is deserving or entitled to certain privileges". However, this stereotypical attitude of entitlement may or may not apply to those who are actually categorized as Millennials. Though the exact range of birth years is often still debated, it is perhaps most important to recognize that generations themselves are characterized by "significant life events at critical developmental ages," (Kupperschmidt, 2000, p. 66). This characteristic is largely satisfied by the range of this study, which suggests millennials were born between the years of 1982 and 1997. This would mean that in 2017, the eldest of the millennials would be aged 35 years; the youngest being 20 years old.

A number of studies have been conducted regarding Millennials. Researchers have made attempts to understand which characteristics set the millennial generation apart, performing studies to identify certain personality traits or behaviors that can be used to categorize the group. Another topic of discussion concerns methods of handling millennials in various settings. Various studies have sought to discover the level of entitlement of this generation, but there are few that focus on how Millennials themselves perceive such entitlement. While the importance of understanding the effects of the new generation cannot be overstated, it is perhaps just as crucial to explore how Millennials conceptualize "entitlement" for themselves. Ultimately, this poses two questions: How do millennials conceptualize entitlement? What do millennials actually believe they are entitled to?

2. METHODOLOGY

In an attempt to further examine the conceptual aspect of entitlement, a qualitative survey was developed. This survey was comprised of sixteen open-ended questions that respondents were able to answer using their own ideas and wording. Demographic questions were also incorporated; these consisted of age and gender. The survey was distributed by means of various social media platforms, including Facebook.

3.1. Sample

The survey was completed by a sample size of approximately ninety-eight individuals. Of these individuals, approximately 81% were female and 19% were male. The age of respondents ranged from eighteen to fifty years old, with five outlying ages either below seventeen or above fifty. Approximately 89% of respondents fell within the millennial age range of eighteen to thirty-five years old.

3.2. Measures

Survey questions sought to address particular themes that millennials may or may not associate with entitlement. Other items attempted to identify what the group felt entitled to in three separate situational aspects: College, Work, and Life. *Table 1* includes the survey questions used and what they seek to measure.

Table 1.

Survey Questions & Intended Measures	
Question	*Measure*
"What are some synonyms or other ways of saying "entitlement"?"	-Explores the respondent's understanding of "entitlement" in a general sense.
"In your opinion, what is an individual entitled to during college?"	- What tangible and intangible items do respondents feel are to be made available to them while attending college?
"In your opinion, what is an individual entitled to at work?"	-What tangible and intangible items do respondents feel are to be made available to them in the workplace?
"In your opinion, what is an individual entitled to in life?"	-What tangible and intangible items do respondents feel are to be made available to them throughout life?

4. CONTENT ANALYSIS

A codebook and system of classification for each survey question was established. Based on the frequency of concepts that occurred, a set of themes was also developed to describe the various answers of the respondents. *Table 2* lists eleven major themes that were identified while coding, and the definitions of each. The process for coding was taught to research team members to ensure categories could be applied consistently. This process involved a sample of the survey questions being separately coded by two raters and later analyzed to ensure that the codes would be applied consistently.

Table 2.

Definitions of Major Themes	
Explicit Agreements	Factors previously agreed upon, and therefore rightfully expected
Finance	Monetary descriptions or conditions
Implied Rights	Privileges that are self-evident in the given context
Necessities	Materials or resources necessary to complete assigned tasks
Nothing	No elements should be expected, regardless of the given situation.
Opportunities	Situations or conditions that make the attainment of a goal more likely
Personal Satisfaction	Realization of potential or goals
Relationships	Items relating to human interaction, specifically communication and emotional support
Something for Nothing	Achievement or reward is expected to be given, not earned
Supplemental	Elements expected in addition to basic necessities, though they are not typically required to be given
Equity	Equal treatment and consideration

5. RESULTS

Respondents were first asked to list words that, in their opinion, represented “entitlement”. Approximately 63% of responses related this concept to the idea of “Privilege;” 21% associated it with being “lazy” or “spoiled.” Entitlement was analyzed according to three separate situational factors; College, Work, and Life. When asked what an individual was entitled to during College, about 24% of answers were associated with the theme of Implied Rights, such as “education” or “safety.” 21% of answers fell into the Supplemental theme, many of which specified that an individual is entitled to a “quality” education or “faculty who care.” In the category of entitlement at Work, three major themes stood out as almost equally important to respondents. These themes consisted of Finance aspects such as “reasonable compensation”, which related to 22.4% of answers; Implied Rights such as “safety”, also linked with 22.4%; and Equity such as “justice” and “respect”, which corresponded with 23% of the answers given. Entitlement in Life focused on three major themes as well. Nearly 40% of the answers related to lifelong entitlement were classified by the theme of Personal Satisfaction. Close to 30% of answers were connected to Implied Rights, and over 13% of responses claimed individuals are entitled to Nothing.

6. DISCUSSION & CONCLUSION

Conclusions can be drawn by analyzing the frequency of each theme as it relates to the concept of entitlement. It is apparent that the theme of Implied Rights is given extra consideration due to its frequency being among the most popular themes in all three situational categories. This may be an implication that Millennials feel most entitled to factors that are naturally anticipated based on the situation. In regards to entitlement during College, the fact that Supplemental themes take precedent over all other themes, excluding Implied Rights, may suggest that in addition to privileges that appear to be self-evident, millennial students’ second primary concern is the quality of those self-evident privileges.

Respondents felt entitlement at work in relation to Implied Rights, as well as the themes of Finance and Equity. It is also worth noting that in the category of Workplace entitlement, 0% of responses were associated with the theme Something for Nothing. These results as a whole would suggest that millennials have some kind of justification behind what they feel entitled to in the workplace, particularly because none of them claim to be owed any tangible or intangible items in this scenario without first meeting some type of requirement.

Implied Rights were again important in the category of entitlement in Life, though not nearly as crucial as the theme of Personal Satisfaction. It should be noted that there were more respondents who claimed entitlement in life equated to Nothing than in the previous categories. This proves to be an interesting dynamic, as it would not only suggests that an individual is entitled to their personal aspirations, but that they must also individually seek out opportunity for themselves. However, correlations among categories have not yet been measured or compared. The contribution of exploratory research such as this creates an opportunity to delve further into these correlations and perhaps even develop a theory for what causes entitlement to occur.

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Children's Exercise Preferences: Exergaming vs. Traditional Gym Equipment

Sarah Taravella[1], Dr. Holly Kihm[2]
[1]Southeastern Louisiana University, Box 10863, Hammond, LA 70448. sarah.taravella@selu.edu
[2]Southeastern Louisiana University, Box 10863, Hammond, LA 70448. Holly.kihm@selu.edu

ABSTRACT

The prevalence of childhood obesity in the United States affects 12.7 million children and adolescents, resulting in the early onset of detrimental health risks such as cardiovascular disease and type 2 diabetes (The State of Obesity, 2017). Exercise interventions can be an effective method to improve a child's body composition (i.e. increase lean body mass and reduce percent body fat). The amount of exercise children are getting per day seems to be falling below the recommended daily amount, which, according to the CDC, is at least one hour per day. During these 60 minutes, children should incorporate aerobic activity, muscle strengthening and bone strengthening activities. (CDC, 2015).The purpose of this study was to determine if children would spend more time participating in exergaming activities or spend more time using traditional gym equipment (such as a treadmill, elliptical trainer, or cycle) during 40 minute exercise sessions.

1. METHOD

Twelve children participated in the study. They were all participants of a larger after school program (Interactive Physical Activity Lab) at Southeastern Louisiana University. The participants ranged in age from 6-13 years, and both parental consent and child assent were obtained before the study began.

Each child had the opportunity to participate in an exergaming activity and a traditional gym activity such as using a treadmill. They were instructed to play the exergame or stay on their chosen piece of equipment for as long as they wanted to, up to 20 minutes. The time each child spent on the activity was recorded. Next, the children were instructed to change activities. If they were on a traditional piece of equipment, they were asked to play an exergame. The children who completed an exergame were asked to choose a traditional piece of gym equipment to use. Again, the children were instructed to stay on their activity for as long as they wanted to, up to 20 minutes. The time each child spent on the activity was recorded. During each 20 minute segment, the children also had the choice to stop exercising at any point. The results were entered into Statistical Package for the Social Sciences (SPSS) for analysis.

2. RESULTS

An independent samples T-Test was conducted to compare age groups in time spent participating in physical activity and choice of physical activity (exergaming or traditional gym equipment).The age groups were divided into 2 separate groups. Group one included ages 6-7 (n=5) and group two included ages 8-13 (n=7). There was a significant difference in time spent participating in physical activity, where children ages 6-7, participated in more physical activity than children ages 8-13 ($p = .027$). There was not a significant difference on physical activity type between age groups.

A second independent samples T-Test was conducted to compare choice of physical activity type on time spent participating in physical activity. There was a significant difference

between physical activity choice and time spent participating in physical activity. Participants who chose exergaming spent more time participating in physical activity than participants who chose traditional gym equipment (p = .010).

3. DISCUSSION

Results from the study supported findings from previous studies showing that children who engage in exergaming participate in the activity for a longer period of time than children who use traditional gym equipment, such as treadmills, cycles, and ellipticals (Fogel, Miltenberger, Graves, & Koehler, 2010; Sun, 2013; Gao & Xiang, 2014). Playing an exergame for one hour a day can be a fun and engaging way for children to achieve their recommended one hour of physical activity per day. With the many game choices available, children of all ages and abilities can have fun while staying active.

An interesting finding was that children ages 6-7 were engaged in their physical activity choice longer than the children ages 8-13. There was no significant difference involving the type of activity chosen, so the reason for these results can come from multiple factors. For example, the older children may have lost interest quicker than the younger ones, so the option to be able to sit out sounded more appealing to the older kids than the younger kids. Another reason could be that the older kids do not have as much energy as the younger ones, resulting possibly from harder school days, or a slower metabolism. As the results have suggested, different strategies are needed to help make physical activity appealing for all age groups.

The study did have some limitations. First, the sample size of children was small. Even though the results were significant, they cannot be used to generalize all children in regards to their physical activity. Second, the children go to the IPAL frequently, so the option to be able to sit out and not partake in physical activity for a change may have seemed more appealing to them, as it was something out of the ordinary for them to do in lab. This would explain why a lot of the older children did not partake in physical activity compared to the younger ones.

It is very important for a child's health that they stay physically active. Though the amount of time children spend in front of a screen may hindered this, technology such as exergaming on a Wii or an Xbox Kinect, can help encourage children to be more physically active. These games usually include achieving goals, and many of them have familiar characters from popular shows and movies. These may be very appealing to children, which make them a great option to help increase physical activity participation.

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Design and Construction of Multiwire Proportional Chamber for Cosmic Muon Detection

J. Tran[1], J.H. Oh[2], and H. Natori[3]
[1]Jessica Tran, Tulane University, USA jtran14@tulane.edu
[2]Jae Hwan Oh, KAIST, South Korea ojh3834@kaist.ac.kr
[3]Dr. Hiroaki Natori, CAPP/IBS, South Korea natori@ibs.re.kr

ABSTRACT

A multiwire proportional chamber (MWPC) was designed and constructed for theoretical muon particle detection from cosmic rays. The purpose of the MWPC is to detect the trajectory of charged particles and to identify the particle by measurement of energy loss. The wire plate and signal-amplifying circuit design is determined by the Bethe-Bloch formula with Garfield simulations. The low-cost construction of the MWPC in this research serves as an ideal challenge to apply basic knowledge of general and particle physics to all aspects of design and construction for a simple particle detector.

Key Words: particle detector, multi-wire proportional chamber, cosmic rays, muons

1. INTRODUCTION

In 1992 Georges Charpak won the Nobel Prize for his invention and development of the MWPC. While the development of advanced particle detectors increases, the MWPC continues to be recognized as the standard solution for particle detection. The MWPC is a proportional chamber that detects charged particles and gives information of their trajectory. The construction of the MWPC is centered on a plane of parallel wires that act as the anode between two parallel cathode plates, which create the gas chamber (Figure 1).

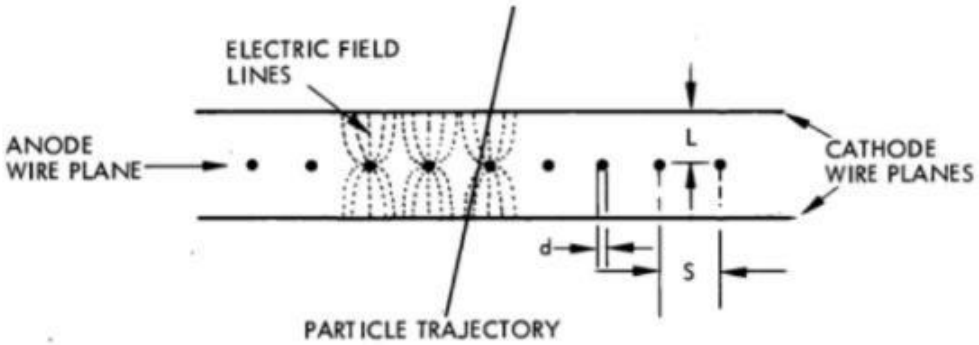


Figure 1. Cross section of chamber with anode wires perpendicular to plane of page (Doolittle)

As the electric field strength increases around the wires, a Townsend avalanche begins with primary electrons accelerating to reach kinetic energies to ionize the gas mixture surrounding the wires (Figure 2).

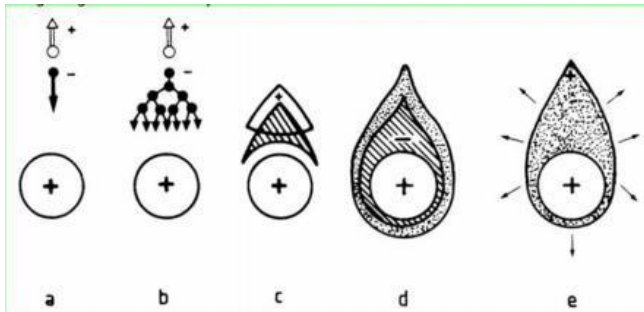


Figure 2. Townsend avalanche increases the number of electrons as electrons continue to drift towards wires

The number of electrons increases exponentially as electrons continue to drift towards the wires. This drift produces an electric signal that is proportional to the number of electrons being collected.

2. METHODOLOGY

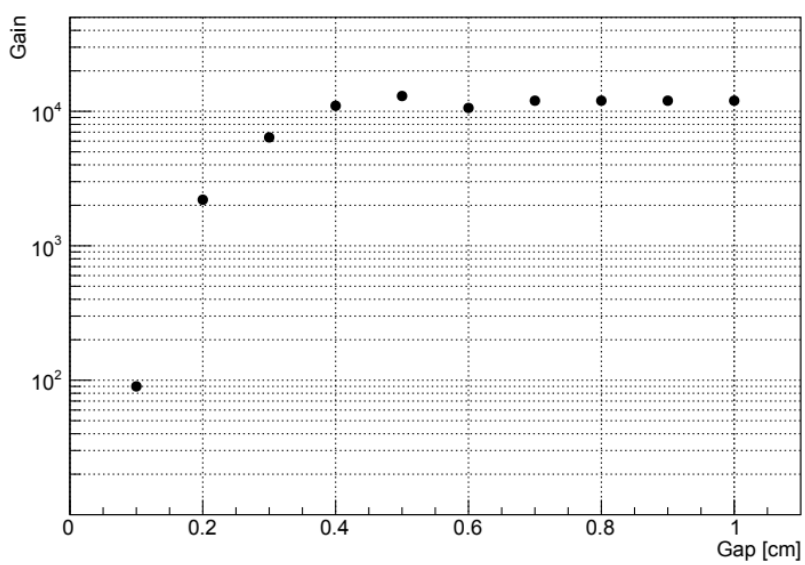
2.1 Anode Wire Plate Design

A mixture of noble and molecular gas (70% Ar and 30% CO_2) was used to ensure stable avalanche formation. The number of primary free electrons was calculated from Bethe-Bloch formula based on the gas mixture and 3.2 mm thickness of the gas chamber (Eq. 1). The number of primary free electrons of the chamber was calculated to be 30.

$$-<\frac{dE}{dx}>=\frac{K}{2}z^2\frac{Z}{A}\frac{1}{\beta^2}[\ln\frac{2m_e\beta^2c^2\gamma^2K_1}{I^2}-\beta^2]$$

Eq. 1 Bethe-Bloch Formula: Average rate of energy loss over distance for charged particles

Based on this formula, a computational simulation was created with Garfield, a drift-



chamber simulation program. The gas electron gain was optimized by 10^4 to determine the range of optimal wire-wire gap length.

Figure 3: Simulation of optimizing wire gap length for saturated gas gain of 10^4

The voltage supply and wire space were set respectively to 1.55kV and 0.75cm. Upper and under wire gap size were set to 1.6 mm each. The optimal wire gap length was determined to be 0.6-1.0 cm.

2.2 PCB (Printed Circuit Board) Design

Several obstacles were considered when designing the circuit system and its necessary components. Because of the high voltage source, a low-pass filter was needed to decrease the high frequency noise. The oscilloscope that graphed the signals could only read a voltage signal while the wires only conveyed current. An integrator and amplifier were used to convert current into voltage. Because integration time was projected to be 100 ns and amplification rate to be 10^{12}, the expected signal size was calculated to equal 50 mV. The signal-amplifying circuit board for the anode wire plate was constructed using the program DesignSpark (Figure 4).

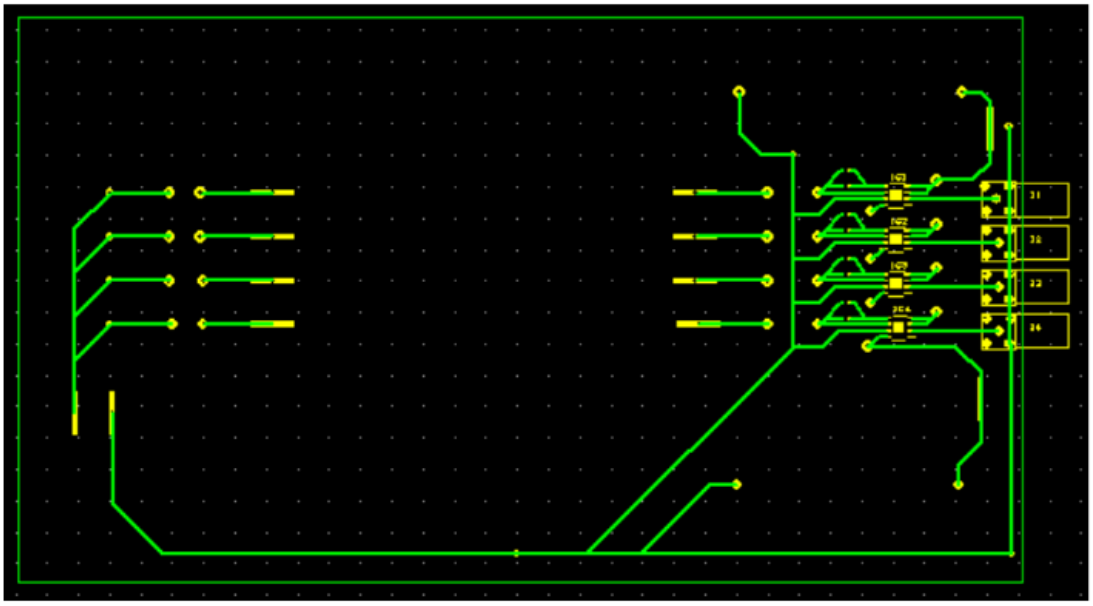


Figure 4. From right to left, PCB schematic design includes the low pass filter, amplifier, and integrator

The PCB design was manually etched onto a copper plate (Figure 5). The design was printed on A4 size paper and fixed in position on top of the copper plate.

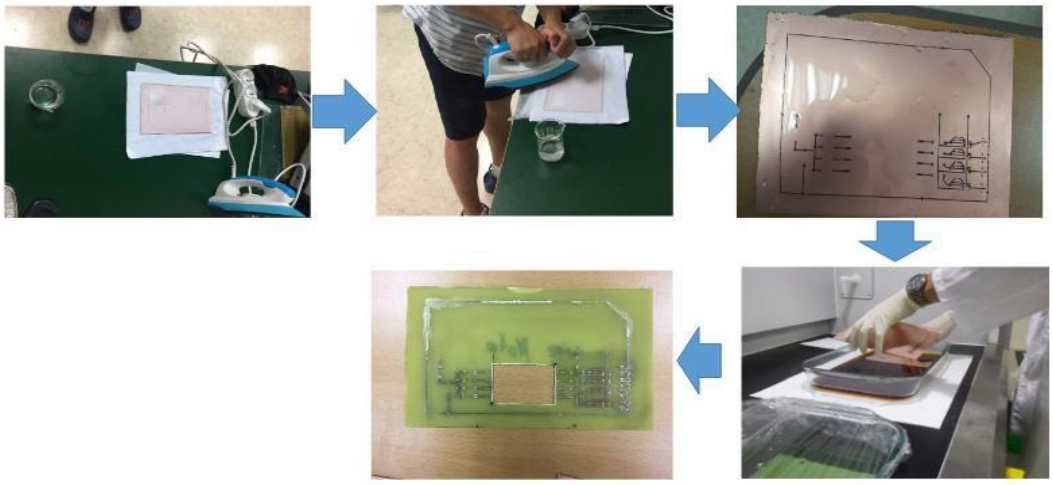


Figure 5. PCB etching process with heat and etching fluid

Water was poured onto the design to make it damp enough so the iron would not burn the design. As a cautionary step, a wet towel was placed on top of the design before the iron was pushed onto it at 300ºC. The heat allowed the ink from the design to be transferred onto the copper plate through vapors. Before the copper plate was submerged into etching fluid, disturbed parts were recovered with a permanent marker. The etching fluid stripped the copper layer from the board leaving only the PCB design outlined in copper, creating the anode wire plate.

2.3 Final Construction

Gold-plated tungsten wires of 20-30 µm in diameter were used to produce high electric fields close to the anode wire plate while copper plates were used as the parallel cathode plates. Because one oscilloscope was limited to four channels, only four wires were manually soldered onto the anode wire plate with 0.5 N of tension on each wire (Figure 6).

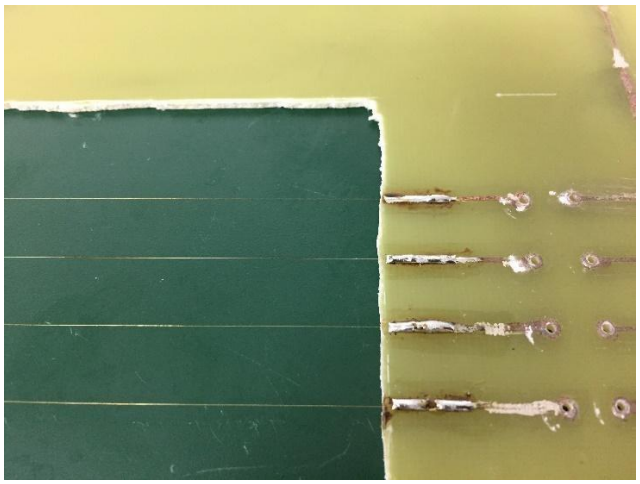


Figure 6. Soldered gold-plated tungsten wires of 20-30 µm in diameter

A spacer was placed in between the anode and cathode plates to create a 1.6 mm gap. Two holes were drilled on top of the cathode plate for gas-in and gas-out tubing. Silicone glue worked as the sealant for the chamber to prevent gas leakage (Figure 7).

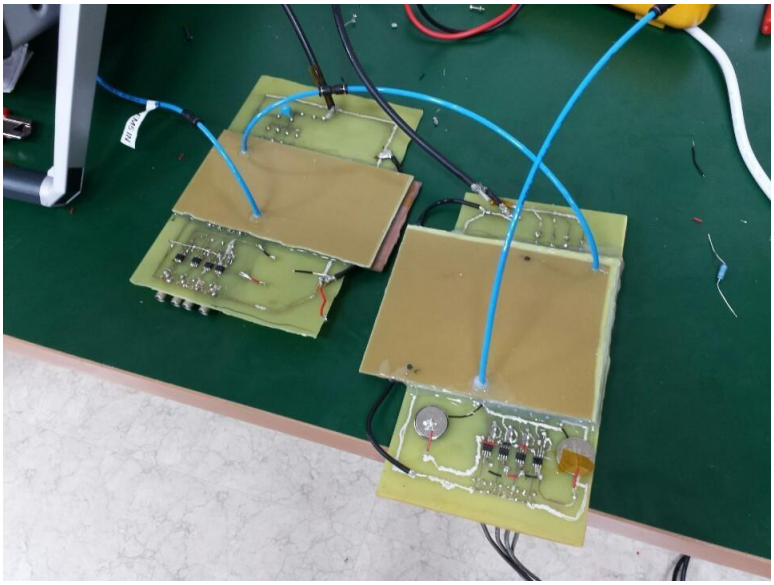


Figure 7. Final set-up of two MWPCs connected to gas line (blue tubes) and high voltage supply (black wires)

3. RESULTS & ANALYSIS

The objective in designing and constructing a MWPC with specifications based on theoretical cosmic muon detection was met (Table 1 & 2).

Table 1. MWPC Design Specifications

Detector Size	21.2 cm x 11.1 cm x 0.64 cm
Active Area	4.13 x 7.43 cm
Gas Mixture	70% Ar, 30% CO_2
Upper Wire Gap	1.6 mm
Lower Wire Gap	1.6 mm
Cathode Plate	13.6 cm x 1.11 cm
Spacer	10.9 cm x 1.11 cm x 0.16 cm
Anode Wire Plate	21.2 cm x 10.9 cm x 0.16 cm
No. of Wires	4
Wire Spacing	8.89 mm

Wire Tension **High Voltage**	0.5 N 1.55 kV

Table 2. PCB Components

Component	**Quantity**
Capacitor (1000 pF)	4
Capacitor (1 pF)	4
Resistor (0.1 MΩ)	4
Resistor (0.82 MΩ)	4
ADA4817-1ARDZ Amplifier	4

However, as the MWPC was tested in an actual system, clear indication of specific particles were unable to be detected.

The presence of dust in the chamber created an electrical connection between the cathode and anode plates, interfering with the Townsend avalanche effect on the wires. Because the chamber was permanently sealed, dust removal was not possible unless a vacuum opening was made prior to sealing. Thus, the wires were unable to convey a strong signal output to the oscilloscope. The amplifiers could have been damaged due to surges from high voltage. Moreover, the internal resistance of the battery increased with time, which caused low voltage supply.

4. DISCUSSION

The processes to design and construct a simple, low-cost multiwire proportional chamber have been presented. Participation in every design and construction aspect of the MWPC have promoted strong application and expansion of general physics knowledge and skills to understand not only the theory behind particle detectors but also the form that follows their function.

To mitigate the rudimentary problems found in the testing, additional components such as diodes would ensure the protection of amplifiers from high voltage surges. A regulator could be used to maintain a constant voltage supply. Moreover, adding LED lights would provide a more visual demonstration to show the circuit pathways or detection of cosmic muons.

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Unfolding the Mystery Behind *Echiniscus* cf. *africanus* (Phylum Tardigrada), One of Hawaii's Indestructible "Water Bears"

Martha Tsaliki[1], Nézira Akobi[2], Harry A. Meyer[3]
[1]McNeese State University, msu-mtsaliki@student.mcneeese.com
[2]McNeese State University, msu-nakobi@student.mcneese.com
[3]Department of Biology, McNeese State University, hmeyer@mcneese.edu

ABSTRACT

Tardigrades, also known as water bears, are microscopic animals commonly found in mosses and lichens. We investigated *Echiniscus* cf. *africanus* Murray, 1907, a tardigrade from southern Africa, by means of phase contrast microscopy and imaging software. Twenty-seven slides were acquired from the Bohart Museum of the University of California-Davis, containing specimens of tardigrades that were collected in the 1980s by Dr. Schuster and his colleagues from the Hawaiian Islands. Examination and measurement of these specimens revealed exceptional variation in the presence/absence and length of appendages; in some cases, spines found on one side of an animal were missing on the other. Unfortunately, all original specimens of *E. africanus* have been lost, and the Hawaiian specimens cannot be definitively assigned to the species. This research underscores that when describing a new species, it is essential to use a sufficient number of specimens to account for variability and abnormalities.

Key Words: Tardigrade, *Echiniscus*, body structures, spines

1. INTRODUCTION

Tardigrades, also known as water bears, are microscopic animals (50-600 micrometers in length). They live in marine and freshwater habitats such as terrestrial soil, leaf litter, moss and lichen. Terrestrial species are famous for their resistance to environmental change. In the 1980s Dr. Robert Schuster and his students collected species of the genus *Echiniscus* from mosses and lichens in the Hawaiian Islands. Unfortunately Schuster died before completing his study, so we obtained the slides from the Bohart Museum, University of California-Davis in order to examine and photograph the specimens using a Nikon 50i phase contrast microscope. We measured them using NIS-Elements D 2.30 SPI imaging software.

Schuster labeled 28 specimens as *Echiniscus africanus.* There are six references to this species in the literature. The original description was made by Murray in 1907, who published an additional paper in 1913 giving more information on this species. The animals that he studied were from western South Africa. Węglarska (1962) recorded the species from Vietnam. The fourth paper (da Cunha and do Nascimento Ribeiro, 1964) recorded its presence in Angola and added more information on its morphological structures. The fifth paper (Binda and Pilato, 2012) found two specimens in Tanzania. Finally, Middleton (2003) mentioned that he found *Echiniscus* cf. *africanus* in Lesotho. The Schuster specimens were collected from two Hawaiian islands, four from Oahu and 24 from Kaui.

None of the papers cited above included adequate measurement of important body structures, such as the spines on the dorsal plates, dentate collar on the fourth pair of legs, or the spines on the posterior margin of the scapular plate.

2. RESULTS

Echiniscus africanus is characterized by the presence of large pores and numerous spines on the dorsal plates (Figure 1). Table 1 shows the variation in presence/absence of cirri (spines) on the right and left sides of specimens. The posterior scapular spines are not listed on the table because they demonstrated extreme variation in number (0 to 5 on each side, typically differing between sides). As is often true of *Echiniscus* species, Cirrus B was missing in the majority of specimens, but it would appear as a pair on both sides when it was present. The lateral and dorsal spines in positions C and D were not acting like pairs; frequently one of them would be absent.

Murray (1907) illustrated and described the dorsal cirri at positions C and D as overlapping. However, in the Hawaiian animals these spines were sometimes overlapping, but often parallel. Another feature with high variability was the dentate collar: there was variation among specimens in the number and length of teeth, which also often varied between the right and left legs of the same animal.

Several specimens exhibited abnormal variation in traits, perhaps representing developmental abnormalities. Cirrus A, a sensory antenna on the head, is found in all *Echiniscus* species and not considered variable. At the base of this appendage a small sensory structure, the clava, is always present in *Echiniscus*. However, in four specimens from Hawaii Cirrus A was altogether absent, and in two specimens present only on one side. In specimens where Cirrus A was absent it was replaced by an extra clava. In one specimen the dentate collar was completely absent on one of the legs.

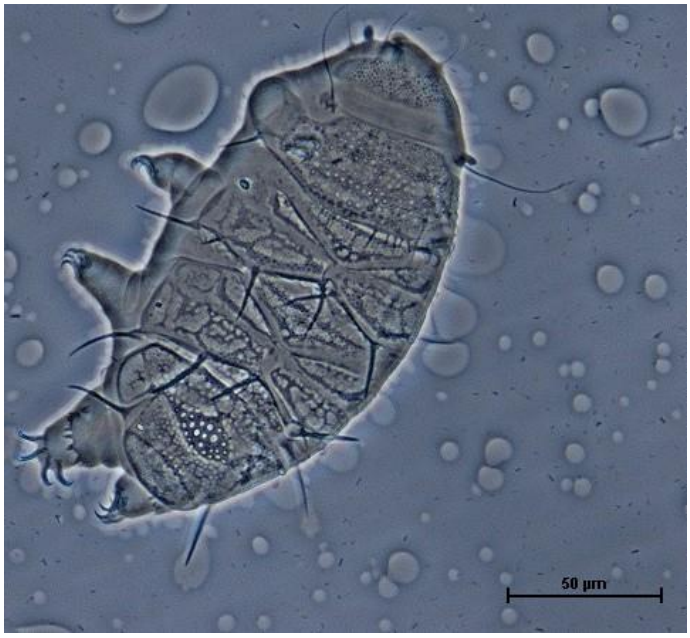

Figure 1. A specimen of *Echiniscus* cf. *africanus* from Hawaii.

Table1. Presence/absence of spines on specimens of *Echiniscus* cf. *africanus* from the Hawaiian Islands.

A - left	81.5%
A - right	85.2%
B - left	40.7%
B - right	40.7%
C - left	96.3%
C - right	100%
C^{l} - left	74.1%
C^{l} - right	81.5%
C^{d} - left	63.0%
C^{d} - right	59.3%
D - left	88.9%
D - right	100%
D^{l} - left	77.8%
D^{l}- right	59.3%
D^{d} - left	59.3%
D^{d} - right	59.3%
E - left	100%
E - right	100%

3. SUMMARY AND CONCLUSIONS

In order to describe or re-describe a species, it is necessary to have the original specimens (called type specimens) that were utilized for the characterization of the species. In the case of *Echiniscus africanus*, Murray's type specimens have been lost. The species has never been collected again in South Africa – the only collection information he provided was that he received them from Mr. Milne from various locations of Cape Colony (1907). Additionally, since we have no type specimens to compare to the Hawaiian animals, we can only compare them to Murray's written description and illustration, which are very inadequate by modern standards. Unfortunately, the Angolan specimens have also been lost. Photographic images of the Tanzanian animals are consistent with Murray's description (Figure 3).

The closest relative to *Echiniscus* cf. *africanus* is *Echiniscus lapponicus* Thulin, 1911. The two species appear almost identical (Murray 1913). They both have all the dorsal spines in the same positions. Based on the descriptions provided by Murray and Thulin, the only distinct difference is the pattern of their pores on the dorsal plates: Thulin (1911) characterized the pores as clusters or small dots on *Echiniscus lapponicus* whereas *Echiniscus africanus* possesses much larger pores.

Given the lack of type specimens or adequate description, we cannot conclude definitely whether the slides Schuster identified as *Echiniscus africanus* really belong to that species or are actually, an undescribed species. They are consistent with the six published descriptions mentioned above, but those descriptions lack many important details and provide almost no information on morphological variation in traits. In conclusion, in Hawaiian *Echiniscus* cf. *africanus* there is considerable variation in body structures, both in individual animals and among all

specimens from the same population. This research underscores that when describing a new species, it is essential to use a sufficient number of specimens to account for variability and abnormalities.

Figure 2. *Echiniscus africanus* from Tanzania (image provided by G. Pilato).

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The Relationship Between Disordered Eating Pathology and Depression

Kathleen Vinci
914 High Street, Houma, LA 70360,
Nicholls State University,
kvinci@its.nicholls.edu

ABSTRACT

Eating disorders, life threatening and complex medical conditions, have the potential to completely uproot the physical and mental health of individuals. Eating disorders are also known to have high co-morbidity rates with mood disorders such as depression. For the current study to explore the relationship between eating disorder pathology and depression, 86 participants completed a survey through SurveyMonkey, which consisted of the Beck Depression Inventory and the EAT-26 (Eating Attitudes Test). The current study hypothesized that a positive correlation would exist between depression and symptoms that demonstrate high risk for eating disorders. No significant relationship between depression and eating disordered attitudes was found. However, the high concentration of scores indicating need for clinical evaluation on both the BDI and EAT-26 revealed that attitudes characteristic of eating disordered and depressive pathologies were widespread in the sample. The prevalence of the clinically significant scores in the sample illustrates a need for attention in the form of continued research on these disorders separately as well as on their relationship.

1. INTRODUCTION

In the United States alone, 10 million men and 20 million women struggle with eating disorders of a clinical nature at some point in their lives, including binge eating disorder, anorexia nervosa, bulimia nervosa, and EDNOS (Eating Disorder Not Otherwise Specified) (Wade, Keski-Rahkonen, & Hudson, 2011). Of the mental disorders classified in the *Diagnostic and Statistical Manual of Mental Disorders*, eating disorders have some of the highest morbidity and mortality rates (Herpertz-Dahlmann, 2009). Understanding of eating disorders has evolved significantly over the years since the first edition of the DSM in which the definition of an eating disorder was limited to “gastrointestinal disorders in which emotional factors play a causative role” (The Committee on Nomenclature and Statistics of the American Psychiatric Association, 1952, p. 30). For instance in 1952, anorexia nervosa was merely a supplemental term for conditions such as constipation or chronic gastritis. Eating disorders do involve disturbances in regulation of weight and eating patterns, but these symptoms alone present far from a complete picture (NIMH, 2014).

It is now widely accepted that eating disorders result from complex interactions among a variety of social, genetic, psychological, and physiological factors (NIMH, 2014). The consequences, just as varied as the causes, are of the social, psychological, and physical nature. Characterized by severe functional impairment, eating disorders are chronic conditions (DeBoer et al., 2013).

In addition to high morbidity and mortality rates, eating disorders also have high levels of comorbidity (Agras, 2001). These include but are not limited to anxiety disorders, substance abuse, and depression (NIMH, 2014). One way to better understand the implications of

disordered eating pathology in the population is to explore the relationships between eating disorders and their comorbidities. For instance, one study illustrated that the same distinct impairment in the regulation of serotonin pathways in the brain results in both depression and binge eating with impulsivity, characteristics of eating disordered behavior (Jimerson, Lesem, Kaye, Hegg, & Brewerton, 1990). Another study demonstrated that the severity of depressive symptoms in restrictive eating disorders, namely Anorexia Nervosa, were exaggerated by malnutrition; the same study also demonstrated that while malnutrition contributed to the severity of depressive symptoms, it was not wholly responsible for their existence (Pollice, Kaye, Greeno, and Weltzin, 1996). The depressive symptoms persisted even when sound nutrition was restored, which showed that depression was part of the original pathology of the eating disorder (Pollice et al., 1996).

The current study sought to expand upon the body of research on the relationship between eating disordered pathology and depression and hypothesized that a relationship does exist between the pathology of both disorders. Specifically, the current study hypothesized that a positive correlation would exist between depression and symptoms that indicate risk for eating disorders. To achieve this, the current author conducted a correlational study using participants who took the EAT-26, a valid measure assessing eating disorder risk, and the BDI, a valid measure assessing severity of depressive symptoms.

2. METHOD

2.1 Participants

The 86 participants in the study were all those who followed the link to a survey on SurveyMonkey. The link was shared through email and Facebook.

2.2 Materials

Beck Depression Inventory (BDI). The BDI is a 21-item reliable and valid self-report measure of depression intensity (Beck et al., 1961). Each item relates to a behavioral demonstration of depression (Beck et al., 1961).

Eating Attitudes Test (EAT-26). The EAT-26 is a standardized self-report measure to assess eating disorder symptoms. It was derived through factor-analysis from the original EAT-40 (Garner, Olmstead, Bohr, and Garfinkel, 1982). The EAT-26, though shorter than the original 40-item questionnaire, is reliable, valid, and strongly correlated with the EAT-40. (Garner et al, 1982). This measure lends itself to symptoms that are specific to anorexia nervosa (Garner & Garfinkel, 1979).

3. RESULTS

The results of the present study are summarized in Table 1 and Figure 1 which shows the trend for measures of eating problems to be associated with lower depression scores. The data were analyzed in GraphPad Prsim for Windows (version 4.0) with the probability of a Type I error set at $\alpha = 0.05$. A multiple regression with BMI, Underweight (dichotomous) and EAT26 scores was run. The model was not significant, but accounted for approximately 1% of the variance in BDI scores (Adjusted R^2). The bivariate correlation between the only variable to approach significance (EAT26) and BDI was $r(79) = 0.17$. No other significant results were obtained.

Table 1. Correlations and Multiple Regression Beta Weights

Predictor	correlation	Beta	Sig
EAT26	0.17	-0.20	0.09
BMI	-0.04	-0.03	0.76
Underweight	0.10	0.06	0.62

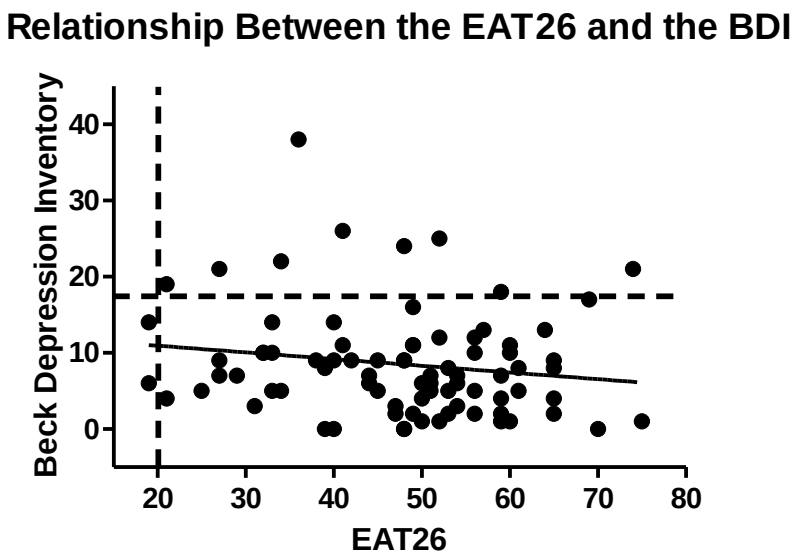

Figure 1.

4. DISCUSSION

The results of the current study were inconsistent with the hypothesis that BDI scores and EAT scores would be positively correlated. The results were not significant but showed that that higher scores on the EAT-26 tended to be associated with lower scores on the BDI. If this study were to be replicated in the future, it may benefit from increased sample size.

Although the results were not significant, the data was not without implication. According to the scoring key for the EAT-26, a score of 20 or above may warrant a professional's evaluation to determine if the concerns reflected by the screening score are of a clinical nature. All but 2 of the subjects in the sample had scores above 20 on the EAT-26. This meant that the majority of the sample possessed concerns and attitudes that were characteristic of disordered eating pathology. High scores on the BDI were also prevalent in the sample. According to BDI scoring, a score of 17 marked the lowest score that deserved clinical attention. Those participants who received scores below 17 are below the horizontal dotted line on Figure 1, and those who scored above 17 are located above the horizontal dotted line. Clearly a portion of the participants scored above 17, indicating that that portion of participants in the sample would benefit from clinical attention regarding symptoms of depression. From these findings it is clear that attitudes and symptoms indicative disordered eating and depression were widespread in the sample. Further research on the prevalence of and relationship between these pathologies is necessary not only to raise awareness but to improve treatment modalities.

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