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Message from Nancy M. Giardina

Assistant Vice President for Academic Affairs

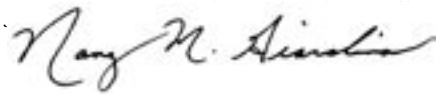
We are proud to present the fourteenth volume of the *Grand Valley State University McNair Scholars Journal*. It is the culmination of intensive research conducted by our student scholars and their faculty mentors through our Ronald E. McNair Scholars Program.

The Ronald E. McNair Scholars Program, now in its 16th year here at Grand Valley State University, provides an opportunity for students and faculty to apply much of what is learned within the classroom by engaging, outside the classroom, in research activities in a particular area of scholarly interest. These research activities provide a journey through the challenges and affirmations of scholarly work and better prepare students for graduate study and the pursuit of a doctoral degree. In addition, GVSU supports the AAC&U position that student engagement in research activities is one of the "high impact" experiences that better prepares students for academic success, transition into careers and the challenges of the 21st century.

Thank you to the faculty mentors who have worked so closely with our McNair Scholars to propel their research skills towards the next level of educational challenges.

Congratulations to the eleven McNair Scholars whose research is presented here. Your journey and the challenges you have met during this scholarly activity speak to your talents and persistence in pursuing both your educational and life goals. Thank you for sharing your talents with the university community and continuing the spirit of this program.

Finally, thank you to all the people behind the scenes that work to sustain this program, guide students to success and produce this



Nancy M. Giardina, Ed.D.
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GRAND VALLEY STATE UNIVERSITY

"Before you can make a dream come true, you must first have one." *- Ronald E. McNair, Ph.D.*

Ronald Erwin McNair was born October 21, 1950, in Lake City, South Carolina, to Carl and Pearl McNair. He attended North Carolina A&T State University where he graduated Magna Cum Laude with a B.S. degree in physics in 1971. McNair then enrolled in the prestigious Massachusetts Institute of Technology. In 1976, at the age of 26, he earned his Ph.D. in physics.

McNair soon became a recognized expert in laser physics while working as a staff physicist with Hughes Research Laboratory. He was selected by NASA for the space shuttle program in 1978 and was a mission specialist aboard the 1984 flight of the USS Challenger space shuttle.

After his death in the USS Challenger space shuttle accident in January 1986, members of Congress provided funding for the Ronald E. McNair Post-Baccalaureate Achievement Program. The goal is to encourage low-income, first generation students, as well as students who are traditionally underrepresented in graduate schools, to expand their opportunities by pursuing graduate studies.

Ronald E. McNair, Ph.D.

Ronald E. McNair Post-Baccalaureate Achievement Program

The Purpose
The McNair Scholars Program is designed to prepare highly talented undergraduates to pursue doctoral degrees and to increase the number of individuals (from the target groups) on college and university faculties.

Who are McNair Scholars?
The McNair Scholars are highly talented undergraduate students who are from families with no previous college graduate, low-income background or groups underrepresented at the graduate level for doctoral studies. The program accepts students from all disciplines.

Program Services
The McNair Scholars are matched with faculty research mentors. They receive academic counseling, mentoring, advising, and GRE preparation. In addition to the above services, the McNair Scholars have opportunities to attend research seminars, conduct research, and present their finding orally or written via poster presentations. In the first semester of their senior year, the scholars receive assistance with the graduate school application process.

Funding
The Ronald E. McNair Post-baccalaureate Achievement Program is a TRiO Program funded through the United States Department of Education and Grand Valley State University.

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The Social Psychology of Love and Attraction

Princess Braxton–Davis
McNair Scholar

Cheryl Boudreaux, Ph.D
Faculty Mentor

Abstract

Love is a universal emotion that has become the basis of marriage and family for many societies, which researchers continue to explore. This research will add to the knowledge of interpersonal romantic attraction, further exposing love's complex nature. Dr. Earl Naumann's (2001) survey in his book, Love at First Sight, *served as a model for the survey utilized in this study. A total of 206 students at a Midwestern university were surveyed. Midwestern university students were sampled in two ways: first an e-mail was sent to the professor of every third class from the Spring semester schedule with at least 10 students in each class, and second, students were asked to participate in the study around campus. Students were at least 18 years of age. They were asked to identify what characteristics drew them to their partner or person of interest.*

Keywords: interpersonal romantic relationships, romance, attraction, love, dating

Love and attraction appear to be universal emotions. Romantic love has been the norm since eighteenth-century Europe, when we began connecting marriage with romance (Lamanna & Reidmann, 2009), but confluent love is on the rise in Western society (Giddens, 1992). Romantic love refers to that which perpetuates gender stereotypes of the breadwinning father and homemaking mother; these roles remain persistent throughout the relationship. It is a love that is supposed to stand the test of time, enduring all hardship. Romantic love emphasizes being in love with a certain individual, "the one." On the other hand, there is confluent love that is more flexible with the roles that individuals play, and it emphasizes a relationship in which the growth of each person is important. The process of two individuals connecting in a meaningful way is particularly fascinating. Love and attraction in the Western world is seen as foundational to the formation and continuation of family, the basic bond between families. An ideology common to Western society is "*Love at First Sight.*" While the majority of Americans believe in this phenomenon, those with higher levels of education are least likely to believe in and have this experience. Dr. Earl Naumann (2001) illustrated this point in his book, *Love at First Sight*, based on research on a sample from the general U.S. population.

In order to form a relationship, there must be some type of attraction, either physically or on a personality level. Initial attraction to a potential mate is highly associated with physical attractiveness. Many researchers have found this physical trait to be a major determinant in the dating and relationship process (Luo & Zhang, 2009; Simon, Aikins, & Prinstein, 2008; Langlois, Rogmann, & Reiser-Danner, 1990). Even during the earliest stages of life, infants show a preference for attractive faces (Langlois, Rogmann, & Rieser-Danner, 1990). Smith (1985) demonstrated similar results by showing that preferential treatment was shown toward the prettiest preschooler peers. Syn-

der, Berscheid, and Glick (1985) showed evidence that high self-monitors showed more interest in the physical appearance of their potential mates. For example, high self-monitors would be very self-conscious about their own appearance and would try to look their best at all times, whereas low self-monitors typically would not care as much. Clothing and cosmetics can enhance one's physical attractiveness, in turn creating a greater commodity on the dating market (Williamson & Hewitt, 1986; Buss, 1998). Physical attractiveness has a strong impact over the lifespan, affecting love and attraction.

Aging is negatively associated with the physical attractiveness. Margolin and White (1987) demonstrated that husbands actually become less attracted to their wives as their beauty fades, which negatively affects men's sexual and overall relationship satisfaction. While physical attractiveness is valued highly by both sexes, males show a higher preference for beauty than do females (Stiles, Gibbons, Harardottir, & Schnellman, 1987; Buss, 1998; Townsend & Levy, 1990; Feingold, 1990; Margolin & White, 1987; Sprecher, 1989; Nevid, 1984). It is evident that physical attractiveness influences who dates whom, but by no means is it the sole force of attraction.

There are a multitude of other factors that contribute to love and attraction besides physical attraction, including physiology and similarity. An example of the former is the effect of pheromones subliminally signaling attraction to a potential mate by men and women (Miller & Maner, 2009; Cutler, Friedman, & McCoy, 1998; Foster, 2008). Another example of the biological aspect of attraction is evident when the body is in a high state of physiological arousal, inducing the perception of others as being more attractive and sexually desirable (Meston & Frolich, 2003; Allen Kenrick, Linder, & McCall, 1989; Cohen, Waugh, & Place, 1985). Pheromones and attractiveness are only sufficient for initial attraction, and the passion that it causes will fade with time. These variables are not shown to lend substance to a relationship.

Research has shown similarity to be an integral part of a relationship that contributes to love and attraction. Opposites at times do attract, but people who share similar ideologies not only attract, but tend to have longer lasting and more harmonious relationships than those who do not (Buunk & Bosman, 1985; Lemay, Jr., & Clark, 2008). Leitner and Klion (1986) extended this finding to individuals with similar levels of self-esteem for those who had high self-esteem. People who share attitudinal similarity in essence share similar behavioral patterns. For instance, individuals who have a sedentary lifestyle may be overweight and seek out an overweight partner, just as an athletic type may seek out another athletic type, especially for younger and elderly couples (Schafer & Keith, 1990; Kalick & Hamilton III, 1986). Similarity proves to be another great promoter of attraction.

What influences attraction between two individuals cannot be understood without identifying the context in which it occurs. The context can be seen among nations or within one's own culture. Tang and Zuo (2000) illustrated this point by revealing that Americans are more likely to begin dating earlier, date more often, and become sexually active with their partners than are the Chinese, suggesting that the Chinese have a more restrictive attitude toward their youth being involved in intimate relationships than do Americans. Oner (2000) found that Turkish university students who exhibited more future orientation reported less relationship satisfaction versus those who were present oriented and reported being more content in their relationships, but sought out many short-term relationships. Contrary to these results, a similar study conducted by Sakalli-Ugurlu (2003) found that those who are highly future oriented were more likely to report greater relationship satisfaction. What people are physically attracted to can be manipulated through music lyrics (Carpentier, Knoblick-Westerick, & Blumhoff, 2007). Sexually explicit lyrics are connected to people zeroing in on a potential mate's physical attributes rather than personality or other traits in attraction. Qualities that may be appealing in one setting may be negligible in another and vice versa.

In *Love at First Sight*, Dr. Earl Naumann (2001) combined various perspectives to study the phenomenon of love and attraction. The surveys he implemented integrated items that called for information about what attracted each individual to the person he or she fell in love with at first sight. These items included physical attractiveness, similarity, ethnicity/race, education level, personal demographic information, and so forth. The present study used a modified version of the survey that he utilized to gain more comprehensive insight into how students became attracted to their potential mates. The results of this study from a sample of Midwestern university students will be compared to his findings.

We predicted that physical attractiveness and similarity would be the strongest predictors of attraction, in that order. Personality is developed through a person's identity, which is shaped by his/her perspectives on life, so we expect two people who share ideologies will have similar personalities. Similarity is also measured through demographic information about the participants and the person they fell in love with.

Methods

Participants

A total of 206 university students at a Midwestern university who were at least 18 years of age participated in the study. One survey was discarded because the person reported an unrealistic response of being in love more than 1,300 times. There was no way to verify what this exaggeration could mean.

Procedure

The proposed study utilized a modified version of the aided survey published in the index of *Love at First Sight.* The survey was given to the 250 university students in classrooms, in the student center, and in the library to diversify the range of students. As in the Naumann study, there was a pre-screening for age, and only students over 18 years of age were able to participate in the study. Every third class was randomly chosen from the spring roster to participate in the study. Students were approached at random and asked to participate in the proposed study or prompted in a classroom setting. The survey was collected after a 10 to 15 minute

administration period. Participants' identities were protected. The data were recorded with an identifying number rather than a name to represent the participants in the study.

Measures

The attraction of love at first sight and progressive love relationships were measured on Naumann and Associates's questionnaire through demographic, physical, and personality traits (among others).

Results

Preliminary analyses of data were taken from the descriptive statistics. Roughly, 79% of students chose personality over both physical and career/achievement traits as being the most influential in their attraction to the other person. The majority of the participants reported being in love (81%); the smile was named the most attractive physical feature (93%). Fun was the most desirable personality trait, as reported by 98% of students. The most common location of initial attraction was in an educational setting (33%), and second was through a friend or at a friend's place. A total of 72% of students reported that they were raised by both biological parents.

Further analyses were conducted using the Chi-Squared Test of Significance (see Table 1). There was a relationship between the response variable, "What was the outcome of that experience of love?" and, "Are you now or have you ever been in love?" (Figure 1). A weak relationship was found between being in a relationship and religion of the other person (Figure 2). There was also no relationship between being in a relationship and ethnicity of the other person (Figure 3). There was no relationship between being in a relationship and race of the other person (Figure 4). Even though there is no statistical significance between the type of family structure the student was raised in, the frequency shows that out of the 72% being raised by both biological parents, approximately 60% of those individuals reported ending up in a relationship. There is a similar situation for the participants' parents' marital status, with a frequency of nearly 68%; of that group, about 56% reported ending up in a relationship.

Row Variable	Column Variable	p-value
Relationship	Falling in Love	.000**
	Religion	.075*
	Ethnic group	.475
	Racial background	.227

** p < .05, * p < .10

Table 1. The Fisher's Exact summary statistics for determining whether there is an association between the row and column variables are given in the table above.

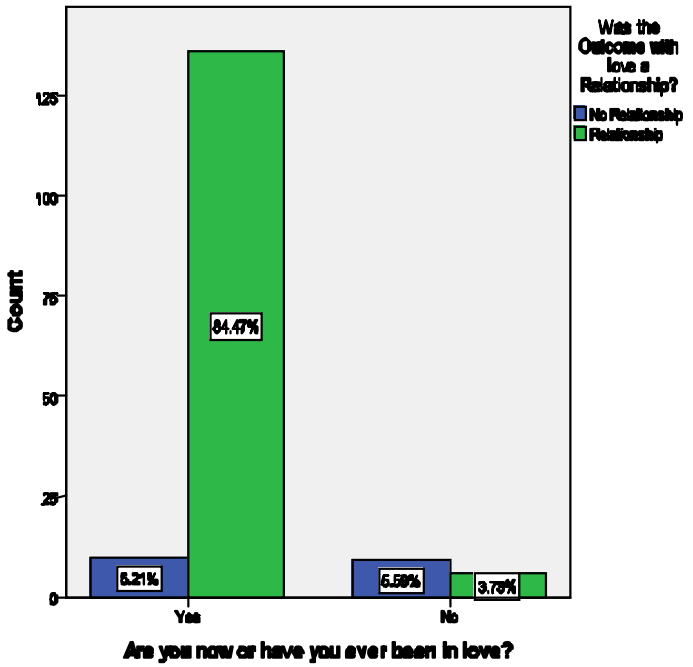

Figure 1. Likelihood of entering into a relationship if a participant fell in love.

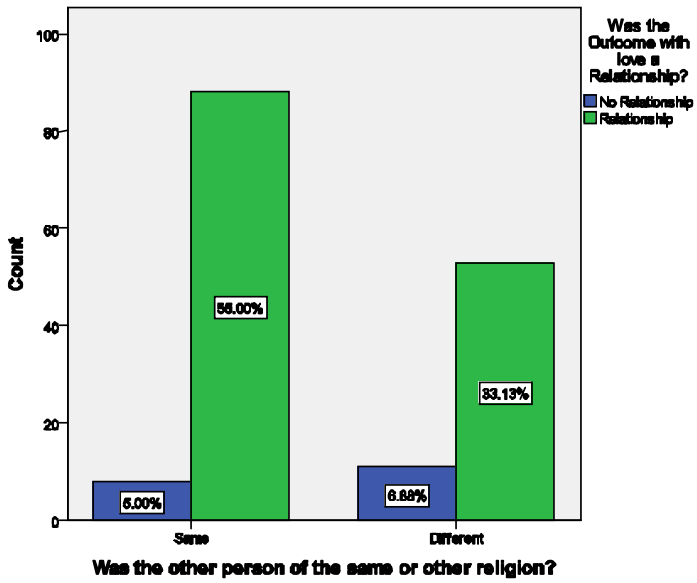

Figure 2. Likelihood of entering into a relationship if a participant fell in love with someone of the same or different religion.

Discussion

Our hypothesis, that physical attractiveness and similarity would be most influential in producing attraction, was partially supported by the frequencies of attracting a potential mate. However, physical attractiveness was not the most sought after trait for the person of interest as hypothesized, but rather it was only second to personality, which was reported to be most desirable. Therefore, personality was a stronger determinant of attraction that led to falling in love than physical attraction. The fact that more students chose personality as being a more important factor of attraction could be due to social desirability. In other words, students could have reported being attracted to the other personality so that they do not appear shallow in the researchers' eyes. However, I propose that the students' responses are accurate. Everyone takes notice when there is an attractive person in his/her midst, but mature individuals are aware of the fact that simply being attractive is not sufficient to sustain a satisfactory relationship. When people choose partners, they are more concerned with how the other person will fit in their lives. This is where the personality becomes important. An individual contemplates how the other person makes him/her feel, which outweighs the single factor of physical attractiveness. It is not rare to hear stories of individuals becoming attracted to and growing to love someone only after they had spent much time with that person. The time spent together allows intimacy to develop, deepening the attraction the individuals share. In other words, while the personality is not necessary for initial physical attraction, it has the power to promote strong feelings of attraction, and it can only enhance the potential for a relationship.

When asked to choose which physical features university students found attractive in their potential mate, they chose the smile and general attractiveness, in that order. The second most sought after trait was general attractiveness. When comparing Naumann's results, men and women ranked these traits in reverse. Why is it that the results are ranked very highly, but neither proves to be constant? Perhaps the smile is more important among a sample of university students because the university is the first level of higher education. This is a time when people are becoming more independent and finding themselves, no doubt a vulnerable period in their lives. It was quite surprising that such a small gesture can have such a large impact, even though it supports the literature that suggests its significance at the time of initial attraction (Walsh & Hewitt, 1985). Smiling is a warm, welcoming gesture that signals openness to others at time when many are feeling overwhelmed and isolated. For many students, being in college is their first time away from their parents in an unfamiliar environment. They are hoping to befriend others and form close bonds. Naumann's sample included anyone over the age of 21, while this study focused primarily on undergraduates. For this study, the age of participants fell mostly between 18 and 25. The varying age within his sample, therefore, yields different results because

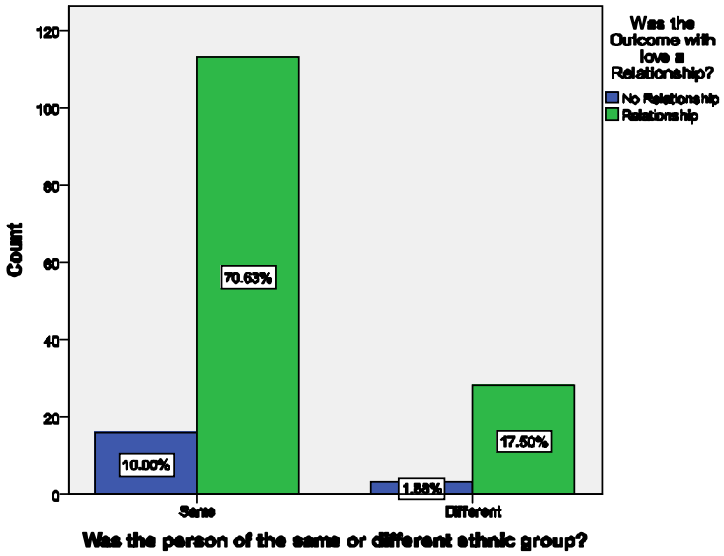

Figure 3. Likelihood of entering into a relationship with a person from the same or different ethnic group.

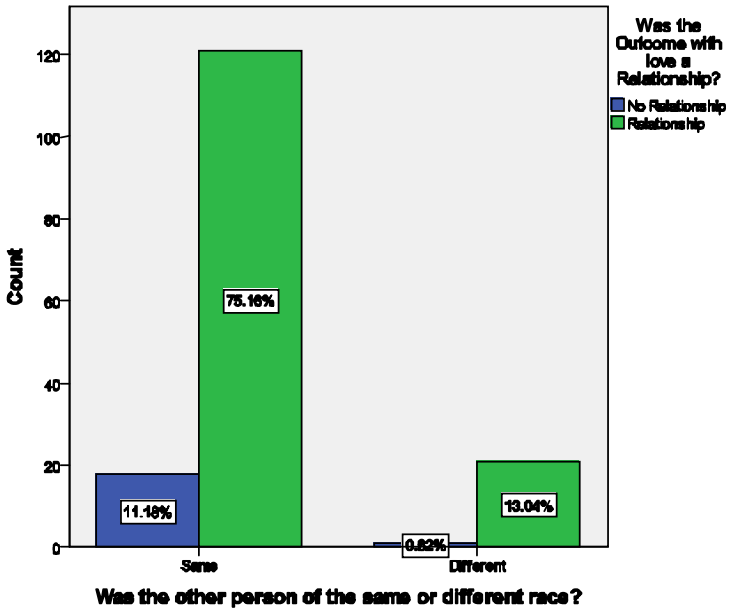

Figure 4. Likelihood of entering into a relationship with a person from the same or different racial background.

there are different life experiences that accompany age, such as getting married, raising a family, divorcing, and becoming a widow. Everyone does not encounter these circumstances, but for the vast majority, this reflects the life cycle.

A similarity found between Naumann's study and this one is that the students were more attracted to fun than any of the other personality traits. Traditional age students are more likely to seek out "fun" partners because they can feed off this positive energy, feeling stress free in an environment that is filled with the pressure of constant deadlines. Naumann concluded that his sample was also interested in a fun personality. Men rated fun as their most significant factor in attraction, while women rated it as their fourth most significant factor (following intelligence, kindness, and humor, respectively). Women in Naumann's study found humor to be the most attractive personality trait, which is closely related to fun. Someone who is not fun would not be perceived as having a good sense of humor.

The overall most desired trait and perhaps the most astonishing result from both studies was the personality. When falling in love, the personality is associated with a long-term relationship, while lust that is highly driven by physical attractiveness. Attitudinal similarity is conveyed through the personality, which lets the other person know how that person is likely to respond in a particular situation, especially within the context of a relationship.

For this study and Naumann's study, shared traits including similarity, religion, ethnic group and race were important features of the other person for over half the participants. Each of these traits is linked to a commonality in background. People are subconsciously drawn to others who have the same familial background. The familiarity breeds comfort. The more alike two individuals are, the more likely those individuals are to have a stable, long-lasting, and happy union.

A relationship developed most often when the participant had experienced love. In other words, individuals are in the process of falling in love over the course of dating or spending a lot of time with each other before entering into a relationship. If dating proves disastrous, then there will not be a relationship. On the other hand, if dating is fruitful, the two become a couple with hopes that their love will unite them for a great while. Additionally, it should be noted that those raised by both biological parents, especially those whose parents remained married or were widowed, were most likely to experience falling in love and enter into a relationship. In line with the literature, these students probably witnessed a more stable union between their parents and were more likely to emulate what their parents modeled and thus entered into a relationship. It is necessary to model healthy relationships so that positive values and coping mechanisms can be present in future relationships through intergenerational transmission.

The results of this study further substantiate evidence from previous research involving interpersonal romantic attraction and relationships. As demonstrated in this study, the way an individual loves and to whom that individual is attracted are visibly affected by the relationships modeled by their caregivers, which supports the attachment and similarity theories (Holman et al., 2009; Luo & Zhang, 2009; Holland & Roisman; 2010), as well as the theory of beauty as a catalyst for attraction (Toma & Hancock, 2010).

The goal of this study is to further the research in the area of love and attraction with regards to university students. Results from this study cannot be generalized to the general undergraduate student population because there may be different regional climates that affect what students find attractive in other places, such as the Southwest or the East Coast. Additionally, the majority of students who responded that they had not been in love did not complete the survey while others did. They also expressed distress that they were not able to complete the study. Future research could examine the qualitative as well as quantitative approach to clear up any doubt as to what information the participants are trying to provide.

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Exploring Men's Intimate Relationships (with Feminism): Another Side of Feminist Consciousness

Joi Dupler
McNair Scholar

Rachel Campbell, Ph.D.
Faculty Mentor

Danielle DeMuth, Ph.D.
Faculty Mentor

Abstract

Research on feminist consciousness and its corresponding benefits has largely been conducted on women. Many feminists find this problematic because it neglects feminist men and the favorable outcomes that have been empirically linked to strong feminist identities for men. In this study, I examined men's feminist consciousness and explored whether correlations exist between men's feminist consciousness, their partners' and peers' attitudes towards feminism, and the overall health of their long-term monogamous relationships. Several different measures of consciousness were utilized, including "Self-identification" (Gurin, 1980), "Feminist Analysis" (Henderson-King & Stewart, 1997) and "Sensitivity to Sexism" (Henderson-King & Stewart, 1997).

Additionally, previously developed measures were used to assess the relationship health of nonfeminist and feminist men. Relationship health was measured on three different components: relationship quality, relationship stability, and relationship equality (Rudman & Phelan, 2007). It was anticipated that men who exhibited higher levels of feminist consciousness would also report higher relationship health than their nonfeminist counterparts. It was also expected that feminist men would report perceiving that their friends and partners held parallel attitudes towards feminism. A survey of undergraduates at a mid-sized university tested these hypotheses and found no correlations between relationship health and feminist consciousness. However, when men self-reported identification as feminist, results revealed that men who identified more strongly as feminist were more likely to identify their partners as feminists and were also more likely to report stronger quality within their relationships than men who identified weakly as feminist. Results confirmed that self-identifying feminist men reported their peers as being likeminded, to the extent that the peers of feminist men were more likely to react disapprovingly to sexism or misogyny and showed a greater acceptance of individuals who adopt feminist identities. Further research should examine the complexity behind male feminist identities to develop new measuring strategies in understanding this discrepancy between self-identification and consciousness, and how men experience feminist consciousness.

Introduction

Feminist identification for women and girls has been associated with many favorable or positive outcomes. For instance, strong feminist identity for women has been linked to high self-esteem (Fischer & Good, 1994), self-efficacy (Foss & Slaney, 1986), and higher academic achievement (Valenzuela, 1993). One study in particular found a positive correlation between strong feminist identity, egalitarian expectations, and sexual assertiveness in intimate relationships for U.S. college women (Yoder et al., 2007). Nonfeminist women exhibited low egalitarian expectations and low sexual assertiveness. In other words, women with stronger feminist ideologies were more likely to endorse egalitarian relationships, practice safer sex and experience more sexual satisfaction than their nonfeminist equivalents.

Although there is a growing body of knowledge that supports feminist identification as beneficial for women, research supporting that it is also beneficial for males remains underdeveloped. Men who adopt feminist ideologies are a largely unknown population. The basis for this is the commonly held belief that men cannot be feminists because they have no personal experience of gender oppression, and consequently cannot create oppositional forms of gender consciousness (Ashe, 2004). While men may experience privilege associated with their maleness, many feminists contend they can still hold a pro-woman stance and assume a feminist identity. Feminist theorist bell hooks (hooks, 2000) argues that a major flaw within feminism has been excluding men from the movement. This is problematic because, as she argues, "Since men are the primary agents maintaining sexism, and sexist oppression, they (sexism) can only be successfully eradicated if men are compelled to assume responsibility for transforming their consciousness of society as a whole" (p. 83). She states that it is absolutely critical that third-wave feminists adopt men as their "comrades in struggle" because sexism and gender inequality af-

fect them similarly, since masculinity often acts as a stranglehold over men's lives. Many feminists share this opinion, such as Connell, who maintains that feminist theory must take men into account and "allows a way for men to relate to feminist women" in order to strengthen relationships and open dialogue between men and women (p. 357). Therefore, it is absolutely critical that feminist men are included in revolutionary struggle for gender equality. To continue neglecting men is to postpone justice.

As a result of males' privileged social position, their experience as feminists is quite different from that of females. This can be seen when many feminist males describe being subjected to harsh criticism and rigid stereotypes from both males and females (Anderson, 2009). Often times, they are ostracized for empathizing with the feminist struggle and are ridiculed for their so-called "effeminacy." Anderson's research further suggests that in terms of social and sexual desirability, feminist men scored lower than other men. She found that ordinary stereotypes of feminist men included: homosexual or bisexual, weak, feminine, and unconfident. Given the stigma associated with these stereotypes, it is likely that men are much less likely than women to label themselves as feminist. This fact is especially important in terms of researching feminist men because, although many men may not adopt a feminist identity per se, they may hold feminist beliefs or exhibit anti-sexist behavior. As a consequence of men being unlikely to self-identify as feminist, previous researchers have relied on other measures that assess feminist beliefs or feminist behavior in an effort to increase construct validity (Henderson-King & Zhermer, 2003). Therefore, careful operationalization is crucial in any research regarding feminist men.

Researchers, however, have discovered evidence that feminism has benefited men's intimate relationships. Rudman and Phelan (2007) examined four different groups that were involved in long-term heterosexual relationships—college-age women and men, and older women and men—and explored their attitudes towards feminists, sexual satisfaction and the stability, quality, and equality of their relationships. The findings revealed that each group benefited, in one aspect or another, from having a feminist partner and being feminists themselves. For example, feminist men with a feminist partner reported greater relationship stability and sexual satisfaction. In other words, feminist men perceived their relationships as being more secure and sexually satisfying compared to nonfeminist men. College age men who self-identified as feminists and had a feminist partner reported greater overall equality in their relationships, meaning they were more likely to be in agreement with their partner regarding gender egalitarian roles within their relationship. Essentially, the results of this study are groundbreaking, in that they challenge the commonly-held belief that feminism is incompatible with romantic relations and negate the notion that feminism is restricted to women.

In an effort to demystify feminist males and further solidify the results of previous research that associates feminist identity to positive intimate relationships between men and women, the purpose of this research is to gain knowledge about how feminist beliefs and feminist behavior play a role in men's intimate relationships. Previous researchers have defined the concept *feminist consciousness* as the awareness and adoption of a pro-woman stance (Henderson-King & Zhermer, 2003); however, this study defines feminist consciousness as exemplifying the theory and praxis of gender egalitarianism through both feminist beliefs and feminist behavior. Relationships between feminist consciousness in men and the overall health of their relationships were examined in male-identified participants in long-term monogamous relationships, with long term being defined as six months or longer. Based on the previous research that supports feminism as being compatible for romantic relationships, it is expected that men with higher levels of feminist consciousness would exhibit higher levels of relationship health, defined as relationship quality, relationship stability, and relationship equality. In addition, men's perceptions of their partner and peers' attitudes towards feminism were observed to test the hypothesis that men would have a partner and friends who hold parallel attitudes towards feminism.

Data and Method

Participants

One hundred and seven male volunteers were recruited using a convenience sample approved by the Human Research Review Committee at Grand Valley State University (GVSU). A research assistant contacted professors from multiple disciplines for their permission to recruit male students in class; once consent was obtained from the instructor, the trained male research assistant distributed the questionnaire to the male-identified students. Participants who were not in a current relationship were excluded for most of the analyses, leaving a sample of 57 volunteers. Of these, 9.1% had been in a relationship less than six months, 16.4% had been in their relationship for six months to a year, 27.3% for one to two years, 23.6% for three to five years, 18.2% for five to seven years, and 5.5% for eight or more years. Two participants who did not detail the length of their relationships and five with relationships under 6 months were excluded from follow up questions on relationship health and partner attitudes, leaving a sample of 50 with relationships of six months or longer. This length requirement of six months or longer was used to ensure a degree of relationship stability and commitment. The average length of relationships was 3.42 years, or three years and 5 months (n=55). There were no significant differences in demographics for men in a relationship and not in a relationship; over 80% of all participants were white and over 90% of participants identified as straight. See Table 1 for additional information.

Independent variables

Sensitivity to Sexism (STS)

Rather than relying on feminist self-identification as the main measure of feminist consciousness, the "Sensitivity to Sexism" scale was developed by previous researchers in an effort to increase construct validity (Henderson-King & Zhermer, 2003). Participants completed the "Sensitivity to Sexism" scale, which assesses respondents' awareness of sexism by examining the participants' behavioral and emotional responses to common situations in which sexism and misogyny occur (Henderson-King & Stewart, 1997).

Nine items were utilized, including "I sometimes feel tense because I might be confronted with something that is sexist," "Sometimes I see things that I think are sexist but that other people don't," and "I'm not always sure how to confront sexism when I encounter it." Responses to each item ranged from 1 (strongly disagree) to 7 (strongly agree), with higher scores reflecting a more feminist response or higher sensitivity to sexism. Scores to all items were summed, creating a scale item with possible values ranging from 9 to 63. The Cronbach's alpha for this scale was $\alpha = .83$.

Feminist Analysis (FA)

Unlike the sensitivity to sexism scale, which evaluates actual feminist behavioral responses, the feminist analysis scale assesses the participants' ideologies regarding gender equality and gender traditionalism (Henderson-King & Stewart, 1997). These items evaluate respondents' beliefs about gender roles and commonly held rationale that are used to legitimate gender inequality. The ten items for the feminist analysis scale can be found in Appendix A. Responses to each item ranged from 1 (strongly disagree) to 7 (strongly agree), with higher scores reflecting stronger feminist ideologies or stronger beliefs regarding gender equality. After items two through six were reverse coded, scores to all items were summed, creating a scale item with possible values from 10 to 70. The Cronbach's alpha for this scale was $\alpha = .75$.

Self-Identification

This model most explicitly evaluated identification as feminist by listing twelve different political and religious social groups (i.e., Christians, Republicans, Democrats, feminists) and then asking the respondent to rate how strongly he identified with each one (Gurin, 1980). Although the participant was asked to report his level of identification for twelve different groups, only the item feminist identification was used; other social groups were not considered in the analyses. Each item was scored from 1 (not at all) to 5 (strongly identify), with higher numbers on the item "Feminist" indicating a stronger feminist identification.

Dependent variables

Relationship Health

Relationship health was assessed using three different dimensions: relationship quality, relationship stability, and relationship equality (Rudman & Phelan, 2007). In total, there were twelve items assessing relationship health, and each of these items was scored from 1 (never) to 7 (always). *Relationship Quality* entails questions about trust and conflict within the relationship, as well as positive and negative emotions experienced within the relationship. The six relationship quality items can be found in Appendix B. After reverse coding of items five and six, scores were summed so that higher scores reflected greater relationship quality. The possible scores ranged from 6 to 42. The Cronbach's alpha for relationship quality was $\alpha = .70$. *Relationship stability* considers the likelihood of the participant ending the relationship. The four relationship stability items can be found in Appendix C. After reverse coding of items three and four, scores were summed so that higher scores reflected greater relationship stability. Possible range was from 4 to 28. The Cronbach's alpha for relationship stability was $\alpha = .89$. Relationship equality measured whether the participants agreed with their partners about gender equality and the appropriate roles in the relationship. The two items were, "How often do you and your partner disagree about your role in the relationship?" and, "How often do you and your partner disagree about gender equality?" Representing the sum of these scores, the relationship equality scale ranged from 2 to 14, with higher scores reflecting greater agreement on gender equality. The Cronbach's alpha for relationship equality was $\alpha = .67$.

Partner Attitudes Towards Feminism

This adapted model was utilized to shed additional light onto the findings of Rudman and Phelan that suggest feminist males are more likely to report their partners as feminist (Gurin, 1980). As with the self-identification model, which prompted respondents to rate their own affiliation, the participant was asked to rate his partner's affiliation with twelve different social groups such as vegetarians, feminists and Christians. While the participant was prompted for all twelve groups, the focus of this measure was his partner's feminist identification; for that reason, none of the other groups was considered in the analyses. Each item was scored from 1 (not at all) to 5 (strongly identify), with higher numbers on the item "Feminist" indicating a stronger feminist identification for his partner.

Peer Attitudes towards Feminism

These items assessed the attitudes of participants' peers regarding misogyny, sexism, and feminist identities. Here, the respondent was asked to think of his closest group of "guy friends" when responding to five different scenarios that measure his peers' attitudes towards feminism and sexism. Peer attitude items can be found in Appendix D. After reverse coding of the third item, each of the items was scored from 1 (they would definitely disagree) to 5 (they would definitely agree), with higher scores indicating the participant's peers as holding greater feminist values. As these items examined different scenarios, they were not summed into a scale but used independently in analyses.

Race	**In a relationship of six months or more**	**Not in a relationship**
White	87.8%	80.4%
Biracial	6.1%	5.4%
Other	6.0%	14.3%
Sexual orientation	**In a relationship**	**Not in a relationship**
Straight	96%	87.3%
Gay/Bisexual/Other	4.0%	12.8%

Table 1. Demographics by relationship status

Results

Due to the focus of this research, most of the analyses were only conducted on male participants who were in a monogamous relationship of at least six months; however, participants who did not meet this criterion were prompted to report their feminist consciousness. As noted earlier, feminist consciousness was measured using three scales: feminist self-identification, feminist behavior (STS), and feminist ideology (FA).

Table 2 shows the descriptive statistics of feminist consciousness variables, with two of the scales separated by relationship status. In regards to feminist self-identification, the mean score for all participants was fairly low ($\bar{x}$= 1.89, s= .948), indicating that this sample, on average, only "somewhat identified" as a feminist (where possible range values for feminist self-identification ranged from 1 to 5). Interestingly, when participants were asked if their partners were feminist, the mean score was higher ($\bar{x}$= 2.45, s= 1.09), revealing that, on average, participants perceived their partners as falling between "somewhat identifying" as feminist and identifying as a feminist "most of the time" (where possible range values for feminist partner-identification ranged from 1 to 5).

Univariate results for feminist behavior (STS) revealed that, overall, participants reported moderately low values on sensitivity to sexism (N= 107; $\bar{x}$= 28.42, s= 8.80) given that the possible range of values for feminist behavior (STS) was from 9 to 63. The values for STS were not significantly different for participants in a relationship of at least six months versus those not in a relationship of this length (in relationship of at least six months: $\bar{x}$= 27.72, s= 8.63; not in a relationship or in a relationship < six months: $\bar{x}$= 28.78, s= 9.35).

The mean scores on the feminist ideology (FA) for both groups of men were relatively high, signifying that, on average, participants held egalitarian views concerning gender (N=107, $\bar{x}$= 52.35, s= 8.80). Given that the summated scores for the feminist analysis scale ranged from a low of 34 to a high of 70, where the possible scores range from 10 to 70, this average points to moderate support of gender equality. The analysis indicates that men in a relationship of at least six months ($\bar{x}$= 54.62, s= 8.30) had a significantly higher level of feminist ideology than men who were not in a relationship ($\bar{x}$= 50.69), s= 7.34), t (101)= -2.55, p= .012. This result reveals that men in a relationship held more egalitarian beliefs regarding gender and were less likely to support gender traditionalism compared to men who were not in a relationship.

Measure	*Mean*	*Standard Deviation*
Feminist self-identification	1.89	.948

N= 107. The range for feminist self-identification index was 1-5.

	In relationship of 6+ months		**Not in a relationship**	
Measure	*Mean*	*S.D*	*Mean*	*S.D*
Feminist Behavior (STS)	27.72	8.63	28.78	9.35 (NS)
Feminist Ideology (FA)	54.62	8.30	50.69	7.34*

Ns= 50 male-identified individuals in a monogamous relationship of at least six months and 55 male-identified individuals not in a relationship (or in a relationship of less than six months).

*p < .05

Table 2. Univariate Distributions for Feminist Consciousness

Relationship Health and Feminist Consciousness

To test the hypothesis that men with higher levels of feminist consciousness will also exhibit higher relationship health than men who do not, nine separate bivariate regression analyses were conducted; the dependent variables were relationship quality, relationship stability, and relationship equality. The independent variables included feminist self-identification, feminist analysis (FA), and sensitivity to sexism (STS). Table 3 contains the betas and standardized coefficients associated with each dependent variable.

The results indicate a positive relationship between feminist analysis and relationship quality, suggesting that men who hold stronger feminist ideologies report higher quality of relationships with their significant other ($\bar{x}$= 54.62, s= 8.30) than men with weaker feminist ideologies ($\bar{x}$= 50.69, s= 7.34), (F (1,44)= 5.901, p< .05). More importantly, this result suggests a contradiction regarding the frequently-held notion that feminism and romance are incompatible. Although feminist ideology is a significant predictor of relationship quality, it was not found to be significantly related to relationship equality or relationship stability.

It was predicted that men who exhibited a higher sensitivity to sexism would also report higher relationship health in all three aspects: quality, stability and equality. The results failed to support this expectation, as no significant relationships between feminist behavior (STS) and any aspects of relationship health were found. Based on previous findings that linked feminist identity to favorable outcomes for men, it was predicted that men who identify as feminist would exhibit higher relationship health than men who do not

identify as feminist. As seen in Table 3, findings from the regression analyses did not support this hypothesis, as no significant relationships were found in the bivariate analyses of feminist identification and the three aspects of relationship health.

Partner Attitudes towards Feminism

To test the hypothesis that feminist men would be more likely to report their partners as feminists, a Pearson product-moment coefficient was conducted between the feminist self-identification item and feminist partner-identification item. As expected, the results indicate a strong positive relationship between feminist men and participants reporting their partners as feminist, $r(42) = .661$, $p < .01$. This result confirms findings of previous researchers that suggest feminist self-identification among men is correlated to reporting their romantic partners as feminist (Rudman & Phelan, 2007).

Peer Attitudes towards Feminism

Regardless of the relationship status of participants, they were prompted to respond to the five peer attitude items listed in Appendix D. These items assessed the participants' perception of their peers' attitudes towards feminism, namely, the extent to which the participants' peers accepted misogyny, sexism, and individuals who adopt feminist identities. These items were developed to gain additional insight on feminist and nonfeminist male lives. Tables 4 and 5 contain the descriptive statistics of all five items, with Table 5 separated by relationship status.[1] As noted earlier, participants were asked to think of their closest group of guy friends when responding to these five items. The possible values for items one, two, three and five ranged from 1 (Sexism never occurs/They definitely disapprove) to 5 (Sexism frequently occurs/They would definitely approve), while observed values ranged from 1 to 5. For the fourth item, they were 1 (They would definitely disapprove) and 6 (They already know), while observed values ranged from 1 to 6.

For the first item, "What do you think their opinion on sexism is?", the mean score was (N= 107; $\bar{x}$= 3.67, s= .998), indicating that the participants, on average,

	β	T
Feminist Ideology (FA)		
Relationship Quality (RQ)	.346	2.472*
Relationship Stability (RS)	.018	.123
Relationship Equality (RE)	.015	.099
Sensitivity to Sexism (STS)		
Relationship Quality (RQ)	.125	.866
Relationship Stability (RS)	-.120	-.836
Relationship Equality (RE)	-.040	-.279
Feminist Self-Identification		
Relationship Quality (RQ)	.082	.548
Relationship Stability (RS)	-.015	-.101
Relationship Equality (RE)	.076	.508

*p< .05

Table 3. Regression analyses for feminist consciousness and relationship health

Items	Mean	Std. Dev
1. What do you think their opinion on sexism is?	3.67	.99
2. How do you think your closest friends would react if you were dating someone who self-identified as a feminist?	2.77	.917
3. Imagine that a new person has been added to your group of friends, and the first time you meet them they say a joke that implies that women are inferior to men, how would your friends respond?	2.98	.97
4. How would your friends respond if you told them that you self-identify as a feminist?	2.69	1.18
5. Imagine that you are listening to music with your friends that you believe portrays women negatively. How would your friends react if you pointed this out?	3.32	.78

N= 107. The range for peer-attitude items ranged from 1 to 5, with the exception of item 4 which ranged from 1 to 6.

Table 4. Univariate Distribution for Peer Attitude Items

[1]No significant differences existed between men in a relationship and men who were not in a relationship. Table 5 can be found in Appendix E.

reported perceiving their peers as believing sexism occasionally occurs. In regards to the second item, "How do you think your closest friends would react if you were dating someone who self-identified as a feminist?", the mean response value was (N= 107; $\bar{x}$= 2.77, s= .917), indicating that respondents, on average, expect their peers as either "probably disagreeing" or "remaining indifferent" to the respondent dating a self-identified feminist. To the third item, "Imagine that a new person has been added to your group of friends, and the first time you meet them they say a joke that implies that women are inferior to men, how would your friends respond?", participants on average reported their peers as remaining indifferent to the sexist joke said in the company of friends (N= 107; $\bar{x}$= 2.98, s= .97).

The fourth item asks the respondent, "How would your friends respond if you told them that you self-identify as a feminist?" This item was utilized to assess the extent to which the participant's friends were accepting of feminist identity. Fifty of the participants (46.7%) reported their friends would definitely or probably disapprove, 42 (39.3%) felt their friends would be indifferent, and only 8 (7.5%) reported their friends would probably or definitely approve. An additional 6 identified their friends were already aware they were feminist. Reflecting on these values and the mean scores for item two, it appears that most participants believe their peers to be disapproving of feminists, since both scores indicate a probable condemnation if the participant or his partner identified as feminist.

Lastly, item five asks the respondent, "Imagine that you are listening to music with your friends that you believe portrays women negatively. How would your friends react if you pointed this out?" The mean value was (N= 107; $\bar{x}$= 3.32, s= .78), indicating that respondents, on average, expected their peers to react indifferently to the misogynist lyrics. As noted earlier with item three, this average value reveals that, overall, participants perceived their friends to hold ambivalent attitudes towards misogynist instances or situations.

Measure	Pearson Correlations	Sign.
Feminist Self-Identification		
1. What do you think their opinion on sexism is?	.247	.098
2. How do you think your closest friends would react if you were dating someone who self-identified as a feminist?	.457	.001
3. Imagine that a new person has been added to your group of friends, and the first time you meet them they say a joke that implies that women are inferior to men, how would your friends respond?	.310	.036
4. How would your friends respond if you told them that you self-identify as a feminist?	.574	.000
5. Imagine that you are listening to music with your friends that you believe portrays women negatively. How would your friends react if you pointed this out?	.327	.027

*p< .05

Table 6. Bivariate Correlations for Feminist Self-Identification and Peer Attitude

Feminist Men and Peer Attitudes towards Feminism

Another purpose of the peer attitude items was to explore whether self-identifying feminist men have peers with attitudes towards feminism that parallel their own, with the expectation that feminist men would be more likely to have like-minded friends. To test this hypothesis, five separate bivariate correlations were conducted between feminist self-identification and each of the five peer attitude items. Table 6 contains the Pearson correlations and significances of each analysis conducted.

Results reveal strong correlations between feminist identification and four of the peer attitude items, suggesting that feminist men have like-minded friends. In other words, self-identifying feminist participants reported their peers as holding positive attitudes towards feminism and being less likely to approve of sexist situations. For example, there was a significant relationship between the item, "How do you think your closest friends would react if you were dating someone who self-identified as a feminist?" and feminist self-identification, revealing that being more feminist correlates with reporting that one's peers will react with greater levels of acceptance towards his hypothetical feminist-identifying partner, r (42) = .457, p< .01. More importantly, a strong, positive correlation was also found between feminist identification and the item, "How would your friends respond if you told them that you self-identify as a feminist?", which reveals that the peers of feminist participants are more likely to respond with greater levels of acceptance towards the participant self-identifying as feminist, r (42) = .574, p< .01.

Discussion and Limitations

Consistent with the findings of previous research, I found that strength of feminist self-identification for men was relatively low. Even when men hold gender egalitarian beliefs, they were unlikely to identify as feminist (Henderson-King & Zhermer, 2003). Findings support a large disconnect between feminist ideology and feminist behavior, which is made apparent when the majority of participants reported believing in gender equality (FA

scale: N=107; $\bar{x}$= 52.35, s= 8.80), namely pay equity or sharing equal roles in running government, but described being less likely to act in an egalitarian fashion (STS scale: N= 107; $\bar{x}$= 28.42, s= 8.80), such as challenging a misogynist joke or reacting negatively to sexism (where possible FA values ranged from 7 to 70; possible STS values ranged from 9 to 63).

Additionally, while there was a significant difference in feminist ideology (FA) present between the two groups of men (t (101)= -2.55, p= .012), which suggests that men who are in a relationship are more likely to be proponents of feminist beliefs, there was no significant difference in feminist behavior between the two groups of men. This implies that, although men in relationships (of at least six months) may hold stronger feminist ideologies, there is nonetheless an inconsistency present between theory and praxis. Moreover, the results shed light on another problem facing the feminist community—disconnected men who align themselves with feminist principles but do not actualize them. The results support a large discrepancy between feminist ideologies and feminist behavior, such that the majority of participants reported believing in gender equality but exhibited less than egalitarian actions in their every day lives (i.e., challenging a misogynist joke or reacting negatively to sexism).

Although the results of this study failed to strongly support the hypothesis of feminist consciousness improving relationships and most of the findings of prior researchers, one analysis indicated that holding feminist ideologies does improve the quality of men's romantic relationships. The significant relationship between the measure of feminist ideology and relationship quality indicates that the proponents of gender equality experienced lower levels of conflict and higher levels of trust and positive emotions within their relationship (F(1,44)= 5.901, p<.05). This result is in harmony with Rudman and Phelan's (2007) proposal that feminism and romance are not only compatible, but also that feminism can actually enhance one's relationship.

In this study, there was a marked difference in feminist beliefs between men in relationships of at least six months and men who were not in a relationship (or in a shorter duration relationship). Men in relationships of at least six months reported holding stronger feminist ideologies than the other men. It would be interesting to explore why this pronounced difference exists between the two groups of men. In addition, results confirmed the findings of previous researchers, indicating feminist-identifying men are more likely to identify their partners as feminist (Rudman & Phelan, 2007).

As expected, it was found that feminist-identifying men also perceived their peers as holding similar values towards gender equality. This result was reflected in feminist men's expectations that their peers would likely disapprove of misogynistic music, r (42)= .327, p< .01, and sexist jokes, r (42)= .310, p< .05. These results suggest that the peers of feminist men are less likely to respond ambivalently towards sexism or misogyny compared to the peers of nonfeminist men. Feminist participants also expected their peers to approve of the participant identifying as feminist, r (42)= .574, p<.01, and approving of the participant's partner identifying as feminist, r (42)= 0 .457, p< .01. These results imply that feminist males' peers are more likely to approve of individuals who identify as feminist. Future researchers should examine whether feminist males tend to pick like-minded, feminist peers and partners, or whether their feminist beliefs shape their peers and partners (and vice versa).

Furthermore, other results revealed that the majority of participants believed their peers would respond or react ambivalently in situations of gender oppression. While, on average, participants personally held feminist values (N=107; $\bar{x}$= 52.35, s= 8.80, with possible values ranging from 10 to 70), they nonetheless reported their peers holding contempt towards feminists. For example, participants, on average, expected their friends to disapprove if their hypothetical romantic partner identified as feminist (N=107, $\bar{x}$= 2.77, s= .917, with possible values ranging from 1 (they would definitely disapprove) to 5 (they would definitely approve)). On average, participants also reported that they expected their peers to disapprove if the participant identified as feminist (N= 107; $\bar{x}$= 2.69, s= 1.18, with a possible range from 1 (definitely disapprove) to 6 (they already know)). These results suggest that most participants believe their peers to be more or less disapproving of feminists. Based on prior findings, the negative stereotypes of feminists may be the underlying reason for the disapproval of feminists exhibited here; it may also contribute to the prevention of men adopting feminist identities (Anderson, 2003).

Limitations of the research include a racially and sexually homogenous sample (the majority of the respondents were white and self-identified as heterosexual) and a relatively small sample size (N=107). There is also a possibility that the strength of using pre-established scales designed to measure feminist consciousness for female participants was problematic for this particular study. Using the feminist consciousness measures "Feminist Analysis" (Henderson-King & Stewart, 1997) and "Sensitivity to Sexism" (Henderson-King & Zhermer, 2003) could have been challenging, since they may not be considered applicable to male feminists, if they do in fact experience feminist consciousness differently than females. Further research should examine this discrepancy between theory and praxis found in college-aged men, in order to fully understand their experience of matriculating or maturing into feminist consciousness.

Appendix A.

Feminist Analysis Items (Henderson-King, 1997)

1. When I am dealing with other people, I sometimes wonder if they react to me the way they do because I am male.
2. When it comes to sex roles and relations between males and females, things will always be pretty much the way they are now. *
3. In general, men are more qualified and successful than women. *
4. Men are more qualified for jobs that have great responsibility. *
5. By nature women are happiest when they are making a home and caring for children. *
6. A woman's place is in the home. *
7. Men and women ought to have an equal role in running business, industry, and government.
8. In the future relations between males and females could be quite different from the way they are now.
9. Do you think that the status of women in American will directly impact your life?

* Items were reverse coded.

Appendix B.

Relationship Quality Items (Rudman & Phelan, 2007).

1. How often do you feel relaxed with your partner?
2. How often do you confide your deepest feelings to your partner?
3. How often do you and your partner quarrel?
4. How often do you and your partner get on each other's nerves?
5. Do you and your partner share similar interests? *
6. How often do you and your partner laugh together? *

* Items were reverse-coded

Appendix C.

Relationship Stability Items (Rudman & Phelan, 2007).

1. How often do you think about finding another partner?
2. How often do you think that things between you and your partner are going well?
3. How often do you think your romantic relationship has a good future? *
4. How often have you considered terminating your relationship? *

*Items were reverse coded

Appendix D.

Peer Attitude Items

1. What do you think their opinion on sexism is?
2. How do you think your closest friends would react if you were dating someone who self-identified as a feminist?
3. Imagine that a new person has been added to your group of friends, and the first time you meet them they say a joke that implies that women are inferior to men, how would your friends respond? *
4. How would your friends respond if you told them that you self-identify as a feminist?
5. Imagine that you are listening to music with your friends that you believe portrays women negatively. How would your friends react if you pointed this out?

* Item was reverse coded

Appendix E.

	In a relationship		Not in a relationship	
Items	*Mean*	*S.D.*	*Mean*	*S.D.*
1. What do you think their opinion on sexism is?	3.78	1.04	3.57	.97
2. How do you think your closest friends would react if you were dating someone who self-identified as a feminist?	2.76	1.08	2.77	.763
3. Imagine that a new person has been added to your group of friends, and the first time you meet them they say a joke that implies that women are inferior to men, how would your friends respond?	3.08	.922	2.89	1.02
4. How would your friends respond if you told them that you self-identify as a feminist?	2.86	1.4	2.64	1.27
5. Imagine that you are listening to music with your friends that you believe portrays women negatively. How would your friends react if you pointed this out?	3.20	.857	3.41	.71

Ns= 50 male-identified individuals in a monogamous relationship of at least six months and 56 male-identified individuals not in a relationship (or in a relationship of <6 months).

Table 5. Univariate Distribution of Peer Attitude Items, by Relationship Status

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Breaking Stereotypes by Obtaining a Higher Education: Latinas' Family Values and Traditions on the School Institution

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Abstract

Higher education is a way to be able to reach the American Dream and help pursue a professional career. The American Dream is a common ideology in the Latino community. Low wage labor in the United States was a way to obtain that American Dream. Today, further generations, immigrant, and nonimmigrant Latinos continue to live the American Dream. A way to reach this goal may be through higher education, which in many cases opens doors of opportunities to better individuals' futures. Education is almost a necessity in the United States, especially to help climb the social ladder. The family may have a large impact on how education is viewed and valued depending on the different values and traditions of that family. As a result, the family may impact decisions made about higher education.

Education and the family are two basic components to an individual's life in the United States, just like in many other countries. Education serves individuals as a way to obtain social mobility and a way to improve their social location. This may be noticed in the skills gained through higher education that may lead to professional careers. In the United States, diverse skills and knowledge may be differentially valued. The skills and knowledge that are highly valued in our society may be gained by obtaining a college education. Higher education reaps social and financial rewards to individuals. As a result, decisions to obtain a higher education or not have strong linkages to later social outcomes.

The family serves individuals by helping shape their personality, goals, and dreams through values and traditions. Values and traditions learned from the family may help mold individuals' decisions regarding their future plans. Different roles of who we are and what we are supposed to be are learned primarily from the family. Similar to education, family is able to structure our future, sharing values and traditions that are differently regarded by society. These values and traditions may guide some individuals towards obtaining a higher education while they may also lead others down a different path.

The current research focuses on adolescent Latinas and their experiences in their families and educational experiences. The purpose of this research is not to make a racial or color distinction; most minorities are often part of the lower socioeconomic status, which may entail that they share similar values and traditions. Families' values and traditions may be similar; the different roles played in the home and by friends may also be similar. It is a possibility that Latino values and traditions are a reflection of social class location. It is also a possibility that these values and traditions may be specific to their culture as Latinos. It is this second possibility that I wish to explore. Research in the past (Gloria, Castellanos and Orozco 2005; Aleman and Aleman 2010; Coleman, Ganong, and Rothraugg 2007; LeCroy and Krysik 2009) has focused on values and traditions that Latino/as may share and the barriers that some Latino/as encounter to obtain a higher education. To better understand the Latina experience in higher education, I instead focus on the particular values, practices, and policies that may be affecting specifically Latina students on obtaining a higher education. Emphasis will also be placed on the avenues of opportunities young Latinas encounter to obtain a higher education.

In this paper I concentrate on two main research questions. First, How do family values and traditions affect eighteen to nineteen year old Latinas' decision-making process of going or not going to college?, *and second,* How does the school as an institution affect Latinas' decision-making process of college enrollment? *Theoretical frameworks of Cultural and Social Capital, Symbolic Interactionism, and Critical Race Theory will be used to better understand the data and results as I explore these research questions. Quantitative and qualitative methodologies will be employed in this study. Secondary data from the Education Longitudinal Study, 2002, and one on one interviews conducted with young Latinas will both be used to fully explore the experiences of young Latina women with their families and schools as they make this decision about higher education. The interviews will help gain an insight on how family ideals are affecting the decision making process of college enrollment of young Latinas. Latinas may rely on their families for support on making decisions that may affect their future.*

LITERATURE

Family Background

To fully understand the Latino family, it is of extreme importance to note that Latino families in the United States may differ due to the variety of cultural differences that encompass what it is to be a Latino. Country of origin of Latinos may include Mexico, Central America, South America, and the Caribbean. The degree of acculturation or socialization into the American culture may also affect the experiences of a Latino family (Contreras, Kerns, and Neal-Barnett 2002). Values are perceptions of what may be good and/or bad passed from generation to generation that may guide decision-making and behavior (Contreras et al. 2002). These values are molded by different cultures, socioeconomic status, demographic backgrounds, and even by the parents' occupation and work conditions (Contreras et al. 2002). Even though some groups may have the same socioeconomic status, it is a possibility that they may have different values and traditions because of their diverse backgrounds and experiences. It may be true that minorities in the lower classes may be very similar because of their socioeconomic status. Past scholars have found that values such as respect, collectivism, having good morals, and belief in authority have been found to be of high importance in the Latino family (Contreras et al. 2002). This may be true for others' experiences, but the traditional role that Latinas learn may or may not be different from that of other populations. For example, according to past scholars, the typical role that Latinas learn while growing up is the role of Marianismo, a role that leads Latinas to become good daughters by being passive and helping around the home, as well as becoming good wives and mothers who take care of everything in the home, children, elders, and other relatives (Williams 1990; Cofresi 2002; Contreras et al. 2002; Coleman et al. 2007). The differences of Latinas' family values and traditions and how these may be viewed by our society are the main purpose of this study.

It is sometimes more difficult for Latina women to acquire full family support while growing up in a more traditional family. In a traditional family, Latinas' roles are to be focused on helping in the house and marriage (Wycoff 1996; Cofresi 2002; Olive 2008; Kimmel 2008). Especially if they have younger siblings, Latinas are expected to help take care of them and help their mothers cook, clean, and do housework. With family support for education, it is easier for Latinas to break away from traditional roles and obtain a higher education, which encompasses following nontraditional roles and becoming more independent (Wycoff 1996). As much as many Latinas would like to fully focus on their academics, it may be harder for them to do so if they have to do housework and fulfill their traditional family duties. This makes it more difficult for Latinas to choose an education, as their perception of college is in some form shaped through their experiences at home.

Education is very important for individuals to rise up the social ladder. Latino families may be more encouraging of their daughters to finish high school and obtain a higher education before marriage. In a study by Plunkett and Bacama-Gomez (2003), more Mexican-origin girls than boys reported having higher academic and educational motivation from their fathers and mothers. More and more Latino families from several cultural backgrounds may be beginning to break away from traditional ideals and encourage their daughters to obtain an education and to become independent. Some nontraditional families may also encourage their daughters to set education as their primary goal. Once Latina women come to the United States, they begin to have the option of choosing parts and pieces of their original traditional values and roles and values of the new culture where they are (Cofresi 2002). To complete high school and continue education on to college may be one of the new options Latinas are encountering today in the United States. Although there may be new nontraditional roles that Latinas encounter, the traditional roles of the Latino family continue to be present.

La familia, or the family, in Latino culture serves as the primary social structure and main source of support for individuals (Williams 1990). Family in the Latino context encompasses distant relatives and friends as well as the nuclear family (Coleman et al. 2007). Family for Latinos is extremely important; it is the main support system that molds the value of Familism, which emphasizes bonds of the family, duties, obligations, unity, and family closeness (Contreras et al. 2002; Coleman et al. 2007; Villanueva and Buriel 2010). It is through these values that individuals connect to each other, creating unbreakable bonds. Latinos feel a higher responsibility to provide assistance to a greater extent to their elders and family members in need (Coleman et al. 2007). The family is formed by norms and rules through parental authority (Williams 1990; Coleman et al. 2007). It is important for Latino children to follow their parents' house rules if they want to receive their full support. Due to strong bonds, it is of high importance not to bring shame to the family name by following the traditions and values of the family and helping each other no matter the situation. One obligation for Latino children may be translating for parents and elderly members of the family (Villanueva and Buriel 2010). Many Latino parents are first and second generation immigrants in the United States, and as a result, may not speak English. In several studies, Latina adolescents have been found to help their families by translating for their parents in different public places and circumstances more than boys (Contreras et al. 2002; Villanueva and Buriel 2010). Translating for family members, therefore, is a gender role expectation for young Latinas (Villanueva and Buriel 2010).

In addition, family members are socialized into gender roles following Machismo and Marianismo (Contreras et al. 2002; Cofresi 2002; Coleman et al. 2007). The meaning of Machismo is male supremacy, emphasizing the man of the house not only as a father but also as a provider and protector. The Machismo value may influence Latino men to fulfill the traditionally patriarchal role. The role of Marianismo emphasizes girls being good daughters and, once married, women being good wives and mothers. This role defines women following the example of the Virgin Mary. Marianismo brings in the importance of a woman taking care

of her family, the household, and children. It involves sacrificing her personal needs for those of her family and her husband, following the example of the Virgin Mary by self-sacrifice for her children (Williams 1990; Contreras et al. 2002; Cofresi 2002). Strong marital bonds may also be the result of the Marianismo value of Latinas towards fulfilling their traditional role as mothers (Williams 1990). Additionally, women are taught to have hembrismo, a superior spiritual strength, similar to the one of the Virgin Mary (Cofresi 2002). Through this spiritual strength, Latina women are able to endure demands of their husbands and family and tolerate abuse (Cofresi 2002).

In the United States, traditional gender roles have evolved. Women today are more active in the labor force and men are also more active in the family (Kimmel 2008). Latino gender roles also may be a reflection of their socioeconomic status and ethnic background (Cofresi 2002). However, these two values, Machismo and Marianismo, continue to make an impact in Latino families. Machismo and Marianismo are the most prominent roles for men and women to follow (Williams 1990; Cofresi 2002; Contreras et al. 2002; Coleman et al. 2007;). Latinas, while growing up, are socialized into a Marianismo role where they are expected by their family to fulfill their household duties. Education may not be part of the role that they are expected to follow. Instead, education may only be a secondary option, making it harder for Latinas to pursue a college education. Additionally, Latinas are often expected to stay closer to home to help and support their families (Contreras et al. 2002). Latinas may feel the responsibility to follow their family duties and help their families because, in a Latino family, family is first and the individual comes second (Coleman et al. 2007).

Additionally, Latinas are expected to take care of their children and help their extended family (Williams 1990). Latinas' obligations in the home and to their family members may affect Latinas' decision of whether or not to obtain a higher education. Responsibilities and obligations may make it harder for Latinas to obtain an education if they are married, as their time and ability to focus on academics diminish with the workload in the household. It is clear that family support is very meaningful for Latinas when it comes time to make the decision on going or not going to college.

Family Support

For Latino families, education does not focus solely on academic performance; Latino families also place a lot of weight on moral development within education (Contreras et al. 2002; Hill and Torres 2010). Scholars have explored the reasons why immigrants come to the United States. One of the primary reasons for Latino parents coming to the United States was to ensure a better education and future for their children as well as a healthy moral development (Contreras et al. 2002). Healthy moral development for Latinos may include an environment where children are able to learn how to make right choices and gain knowledge on what is wrong or right from adults who make up part of their lives. Moral development is a value that Latino families believe should come hand in hand with education. With this in mind, one is able to consider the importance of education for Latinos, contradictory to the stereotype of Latinos devaluating education. Scholars find that Latino parents highly value education. Additionally, past researchers (Villanueva and Buriel 2010) have explored how strong academic performance on the part of immigrant children may be a way to express gratitude to their parents, demonstrating again the value of education in the Latino family.

Other studies have explored a connection between family, community values and self-fulfillment through higher education (Hernandez 1995; Wycoff 1996; Alberta et al. 2005). With higher levels of family and community support for higher education, students feel more confident in obtaining an education and fulfilling their career dreams without feeling restrained (Hernandez 1995; Wycoff 1996; Solberg and Torres 2001). When the student is able to rely on his/her family for advice and encouragement, the family provides the student with a valuable support system. The student may able to express his/her experiences at school with his/her family and look for their help and advice to continue their education after high school.

Furthermore, research outcomes point at mothers of Latinas being equally or more supportive than fathers of Latinas obtaining a college education (Williams 1990; Contreras et al. 2002). Mothers of Latinas seem to be more encouraging and reaffirming than fathers. Also, it has been explored how Latino boys receive more encouragement and support to obtain a higher education than girls (Contreras et al. 2002), which may demonstrate family values affecting educational experiences. This may be a reflection of Latino traditional gender roles where daughters are expected to be more involved in the family and boys are expected to help the family outside the home. Latino/a gender roles and parental encouragement for higher education may affect Latinas' educational choices for their future. The support from their mothers may help Latinas continue their education after high school, while the lack of support from their fathers may impede Latinas from obtaining a higher education. Family support systems enforce high levels of confidence in students that will help students feel comfortable in their environment (Solberg and Torres 2001). Parental support can set high educational standards and expectations for their children (Wycoff 1996).

Students with high levels of confidence are able to build relationships with their teachers, making it easier to obtain role models and mentors in education (Solberg and Torres 2001). This encourages students to pursue a higher education and visualize higher levels of career options. Parents and the family are important supportive figures that make it possible for Latino/as to fulfill their education (Wycoff 1996). When parents are not supportive of their daughters on going to college, it may be harder for Latinas to obtain a higher education. Because of the value of familism and the importance of the family for Latinas, the lack of support may restrain many Latinas from obtaining a higher education. Additionally, gender roles may highly impact the decision of whether or not to go to college. Parents not only help students by pushing them to obtain an education but also by keeping them on track and encouraging them

to focus on their studies. Students who do not have other family members who have obtained a college education may be very dependent on their parents and family support for higher education. Gender roles, family values and traditions may be large factors that contribute to this decision. On the other hand, it is a possibility that the educational institution plays a large role in Latinas' decision on college enrollment. Now I turn to the subject of education to further understand where Latinas are obtaining their information about college, support for higher education, and where they may encounter obstacles and opportunities.

Education

At home, many students are the first ones in their families to attend school in the United States (Olive 2008); in other words, they are the first generation students. If they are the only ones who have gone to school, they may have little understanding at home for this experience. Students who are first generation going to college may lack important information and skills about college (Sterm 2009), not only because they are the first ones in their families going to college, but they may also be one of the first to go to college in their neighborhood. Past scholars (Sterm 2009) have noted that Latinos live in neighborhoods with fewer college-educated individuals. This may be a reason why it may be harder for Latinas to decide whether or not to go to college. Education may be a way to obtain the correct information and knowledge about college for those students who may not have access to this in their homes or their communities.

Education is a way to social mobility; better education may allow one to obtain a better occupation, which may lead to other opportunities and improve one's social location. In addition to leading to the improvement of occupational stability, obtaining an education also benefits society as individuals are more skilled and able to help develop their communities. Latinos are the fastest growing minority in the United States, but this population is not growing dramatically in terms of educational attainment. Today, Latinos make up 15 percent of the traditional college age population between eighteen to twenty-four year olds in the United States (Valverde et al. 2008). By 2020 they are expected to comprise 22 percent of that population (Valverde et al. 2008). In contrast to the relatively fast growing Latino population, high school graduation rates and higher education enrollment has not been steadily increasing (Valverde et al. 2008). Dropout rates of Latino high school students have been as high as 44 percent (Valverde et al. 2008). By the year of 2018, Latinos are expected to be 29 percent of all high school graduates (Valverde et al. 2008). There may be various reasons for this mismatching of increasing numbers in the Latino population and slow or little growth for Latinos' enrollment in higher education.

Latino/a students may lack not only resources that would best represent their culture in school, but also mentors and role models who would encourage them to continue with their education (Hernandez 1995; Hill and Torres 2010). Only 6.2% of full-time teachers in the United States were Latino in the 2003-2004 school year (Hill and Torres 2010), which means that there are few role models and mentors that Latino/as could look up to. Latino/a students may not have enough teachers from their own background. Without being able to relate to their authority figures, they may not feel as comfortable to reach out for help or look up to teachers as role models or mentors.

In past research (Hernandez 1995; Crosnoe 2005), it has been shown that assistance from school guidance counselors and teachers is very important when all students make the decision on going or not going to college. Teachers addressing Latino students do not often take into account the diversity of groups included as Latino, and at times refer to different cultures as one (Hill and Torres 2010). Some teachers even refer to Latino students as "Mexican students" (Hill and Torres 2010). If students are not able to feel like unique individuals while attending school, they may not feel comfortable in the academic environment. Latino students may feel less support or understanding of their teachers, their experiences and the decisions they face regarding higher education. With little or no assistance from teachers from the schools, it is harder for students to make an informed decision about their future. Additionally, without individuals to look up to and guide them, it may be harder for students to pursue a higher education or envision themselves in a higher occupation. Latino/as feel a sense of anger and frustration as the careers they would like to fulfill, they feel, are not intended for a Latino/as (Hernandez 1995). Students may not feel there is a need to continue their education if they do not see Latinos as professionals. On the other side of the story, students who may have role models and teacher support for education may feel more encouraged to continue their education after high school. This may help students decide whether or not to apply to college, and it may also help them gain more information about college and what is necessary to apply.

A lack of opportunities exists which would encourage teacher-student interaction. Little attention is paid to the importance of cultural influence inside the classroom for Latino/a students (Valverde et al. 2008). If there are not many Latino/a teachers, and there is a lack of Latino culture in the schools, teacher-student interaction may be harder to take place because students may not feel comfortable in their environment. One of the major factors that may affect why Latino/as' education rates are relatively lower than other populations may be the marginalization of culture inside the schools.

Recent school-based initiatives in the United States have tried to promote academic success for Latino children through programs that help teach parents how to work with the American school system (Contreras et al. 2002; Valverde et al. 2008). These new programs work to promote understanding to the parents about the American educational system and the expectations of the school, while at the same time focusing on sharing the cultural values of Latino families with school staff. Although programs have been developed, they do not address the Latino community as a whole. Latino parents may have different ideals of what is the meaning of education than that of the school system. Latino parents, in past research, describe ideals incongruent with the school system (Hill and Torres 2010). Parents may feel

as if the school institution does not accept their culture and language differences. Some values and traditions that may be learned in the home, for example the value of education, which for Latino/as means more than books and school and may extend to include morals, social skills, and attitudes, may contrast to what teachers are teaching students. Parents may expect students to learn this from school or be punished if they do not act right in the school. In schools, this may not be the case and teachers may expect parents to teach morals, values, and how to act correctly in their homes. Parents of Latino students feel disrespected and devalued when trying to communicate with the teachers; at times parents do not speak English very well and teachers talk down to them. Parents can feel embarrassed and inferior when they do not have respect from teachers (Hill and Torres 2010). There is a lack of translators or bilingual materials available that may help accommodate Latino parents so that they are able to better understand school initiatives and their child's education. This may impact what parents think of education, and it may shape decisions about education for their children. Even if there have been attempts to help Latino students improve their chances at academic success, for Latino students and other minority students, by the time they reach their junior and senior year of high school, their college choices are highly limited (Gonzalez, Stoner and Jovel 2003). College choices may be limited due to financial availability and lack of correct knowledge about colleges that may offer financial aid or support for students for diverse populations. Additionally, if the parents do not have the correct information due to translation difficulties or lack of respect from the school institution, the support that children should get from their parents if they had the correct knowledge may not be there.

In contrast, schools that may have bilingual information, translators and more advantages for parents to be able to communicate with school administrators and staff may be viewed as an avenue of opportunity for many Latina students. Parents who are able to communicate with the teachers may be able to help their children more in school issues. Parents who are able to understand the goals of the educational system, and when teachers as well as school administration are able to understand the Latino culture, it may be easier for Latino students to have a better school environment and continue their education after high school.

The focus of choosing a school with a specific program moves to financial availability when Latina students are faced with the decision of college enrollment (Gonzalez et al. 2003). Aside from grade point average, Latinas may have to take into account what university they can afford, what is the right information they need, or how much time classes will require outside of the home. Latina students may have family and home responsibilities as well as little financial support. These may be some factors affecting higher education rates for Latinas.

Furthermore, Latinos college enrollment rates overall have only grown slowly over recent years. College enrollment rates for Latinas ages eighteen to twenty-four have positively increased from 16 percent to 24.5 percent between 1980 and 2000 (Gonzalez et al 2004), in comparison to Latino males whose college rates have not improved as rapidly, from 15.3 percent in the 1980's to 18.5 percent in 2000 (Gonzalez et al. 2004). This is a relatively large accomplishment for Latinas' self-betterment and social mobility. In addition to college enrollment, there has also been a 75 percent increase in bachelor degrees for Latinas (Gonzalez et al 2004). This demonstrates that Latinas' involvement in college completion rates is also increasing. This could be due to a more supportive family value system and a more cooperative educational system. In a study by Gonzalez, Jovel and Stoner (2004), college undergraduate and college graduate Latinas were interviewed, and it was uncovered that one of the main sacrifices these women have made to obtain their education has been their families. It can be argued that Latina women who decide to move away to college take on a nontraditional role. Latinas breaking away from the main role of Marianismo may represent nontraditional roles. Additionally, becoming a full time college student in itself and applying more time to education and not the family may be what molds a nontraditional role. Because the family is so important for Latinos, it is very hard for Latinas to be away from their families and miss all the little things that make up their values and traditions.

When Latinas encounter themselves with the decision to go to college, they may also take into consideration how far away their home is from the college or university they want to attend. It may be harder for Latinas to move away from their families with values such as familism. To be able to feel comfortable in a different environment that one is not used to, it may be important for an individual to reach a certain level of acculturation or assimilation to that environment and social context.

Acculturation, Enculturation, and Assimilation

The process of *acculturation* takes place over time and occurs when an individual or a group adopts the attitudes and values of a mainstream culture due to continuous exposure to that culture (Punkett and Bamaca-Gomez 2003; Hurtado-Ortiz and Gauvain 2007; Coleman et al. 2007; Cano and Castillo 2010; Gonyea 2010;). Latinos maintain aspects of their original culture while adopting facets of U.S. culture (Coleman et al. 2007). For example, Latinos may tend to grasp the influences of individualism when it comes to money situations and occupational mobility expectations, which are part of U.S. culture. At the same time, Latinos may keep their family values and traditions, like the importance of elders and Machismo. Exposure to a different culture and the acculturation of this culture are important and may help us understand the Latina experience in academics (Contreras et al. 2002). One of the main measures in past research of acculturation has been the different levels of language use and preference (Contreras et al. 2002). From acculturation, Latino/a teens may find or develop their self-identity and *Ethnic Identity.* Ethnic identity refers to one's sense of belonging to a particular cultural group (Contreras et al. 2002). From this ethnic identity, individuals may take pride in following certain values and traditions passed on in their homes and might also help the find self-identification. Scholars

in the past (Plunkett and Bamaca-Gomz 2003; Hurtado-Ortiz and Gauvin 2007) indicate that acculturation can be related to Latino students' academic performance and educational resilience.

This is also known as *Enculturation*. Enculturation is the process of socialization and the maintenance of original cultural and heritage norms (Cano and Castillo 2010), thus allowing individuals to adopt aspects of individuals' culture but at the same time holding on to facets of Latino culture. Interestingly enough, scholars like Cano and Castillo (2010) have found that Latino students with lower levels of behavioral enculturation are predictors for Latina college students' distress. Assimilation into a different culture may in some cases bring more stress to students, and it may make it harder for Latinas to make a decision of whether or not to go to college if they may not be able to identify with the culture.

The *Assimilation* process has also been evidenced in our educational institution. Assimilation is the process of immigrants blending or merging into the mainstream culture leaving their own culture aside (Golash-Bozna 2006). In the past, some schools forbade children from speaking Spanish during school hours, and if they spoke Spanish they would be punished. Today there are still some cases where Spanish in schools continues to be prohibited (Valverde 2006). This may only force the already harsh assimilation process in Latino students. Although some may believe that this is a way to help students learn English faster, in reality it is a way to make the students feel uncomfortable and lost. In addition, students feel like their home language is not as good as English (Valverde 2006). Latino students may face an internal conflict between family values and traditions and the mainstream culture's values and traditions presented to them through the school institution.

While gaining a college education, Latino students have to go through the enculturation of family values into the college environment (Alberta et al. 2005). Growing up in a Latino family, there may be values and traditions that may directly impact the decisions made by Latinas to pursue their college education (Alberta et al. 2005). If the student's family views this as an important value, it may be harder for her to break away from the mold and go to college before following her family duties. Latino/a students are caught in an acculturation process where the environments of home and school may clash completely. This acculturation, according to Gloria, Castellanos, and Orozco (2005), brings stress to Latinas and makes it harder for them to focus fully on their academics. In addition, it may be harder for Latinas to find a supportive coping system at home, especially if most of their relatives/parents have not been to college and are not able to relate to their experiences. Latinas may also not be able to gain access to the capital that allows for success in college.

Social Capital

Social capital can develop through interactions with others and participation in social networks; this participation may later be used for social benefit (Monkman, Ronald and Delimon 2005). For example, social capital may be developed through the school institution, as students are able to make friendships, which later on may turn into important networks and connections. As individuals grow up and graduate from high school or college, they are able to use those networks and connections to find jobs or a position in fields of interest. Many individuals obtain social capital through their family and school institutions. Students in lower socioeconomic statuses are often at a disadvantage in obtaining valuable social capital. Similarly, Latino students' social capital may not be valued the same as students from higher socioeconomic statuses. This is because most of the connections and networks that Latino students create are not with individuals who may go up the social ladder. Rather, these students rely on other students who are most likely going to end up getting lower income jobs. Furthermore, students who are able to get higher positions are more likely to break bonds with their old neighborhoods and connections may disappear. Similarly, Latinas are affected because it is harder for them to gain valuable social capital that will help them in their future. Since there is not a lot of Latinos in professional careers, it is harder for Latinas to obtain connections that would better their chances at maintaining a connection with other Latino/as in professional fields.

Through the family, Latinas are able to obtain support for higher education; in the schools, Latina students are able to interact in social networks that benefit them in the present and create advantages for their future. For example, first generation Latino students may be able to gain relevant information about how to apply to college or how to find financial aid from other students who have knowledge of this information. Latino students may be able to gain social capital through interaction with other students about American norms and rules. For example, Latino students may be able to learn the value of individualism that is well known in the American society compared to the value of collectivism more known in the Latino family. Additionally, Latina students who may have friends or relationships with other students who have a higher socioeconomic status than themselves may be able to furnish that relationship until they are older. This relationship may help students attain opportunities that without that relationship would not be possible. Non-Latino students are also able to gain social capital from Latino students' culture and their values and traditions that may differ from their own. Social norms of obligation and reciprocity may guide social capital to be negotiated (Monkman et al. 2005).

In the Latino community, social capital may be understood by the depiction of neighborhood and family ties. For example, within the value of "compadrazgo," friends are very close and are sometimes viewed as part of the family. A "compadre" or a "comadre" is expected to help raise children; in cases that the parents can no longer be there for the children, they are expected to step up in place of the parents. Many times, Latinos' social capital is devalued by society. The values and traditions that Latinos carry with them are not acknowledged equally as the social capital from other individuals from other ethnicities or socioeconomic statuses.

Cultural Capital

In addition to social capital, cultural capital is important in our society. Cultures may differ in many ways, such as

knowledge, practices, values and traditions. This is what makes up cultural capital: it is the cultural experiences in one's home and environment (Barone 2006). Similar social skills, language styles, and attitudes are different according to class origins because different social classes share different cultural capital through different social contexts. As a result, students with this capital are rewarded in the school system. It may be true that Latinas in lower socioeconomic statuses have similar cultural capital than other individuals in such socioeconomic status. The difference between Latinas and other individuals may involve the cultural capital that Latinos bring with them from their original countries, such as their native language being either Spanish, or a dialect, values of familism, marianismo and machismo, the values of compadrazgo, or even experiences lived as an immigrant. Cultural resources, however, are not equally valued by society and can lead to different quantities and types of advantages and disadvantages (Monkman 2005). In relation to the school institution, pedagogical rules, practices, and procedures are related to the culture of the upper classes (Barone 2006). In the case of Latino/as, their cultural capital is not, in many cases, valued sufficiently in school or society. Although there have been recent changes in programs to better incorporate Latinos into education, there are still some schools that do not encourage Latino culture. For example, a law in Arizona that denies high schools from teaching Latino Studies was passed recently because state representatives believed that "Mexican-American studies program teaches Latino students that they are oppressed by white people" (Cooper 2010). Latino/as values and traditions are not always respected and well represented in the school institution, as demonstrated in the case of Arizona. Schools that do not allow Latino students and other ethnic minorities to explore their own cultures and history may not encourage Latino students to feel comfortable in the educational environment. Experiences in high school may affect Latinas' decision of college enrollment.

The cultural capital from Latinas may be completely different from other students. Latinas' experiences in the family and their neighborhood, and their values and traditions, create cultural capital that may differ from that of other students. This may include different language, attitudes about friendships, and perceptions on authority. This capital may be valued in other contexts but not necessarily in the school system.

Furthermore, Latino/Hispanic parents may not have the same opportunities to share cultural and social capital with their children. Unlike other minorities, Latinos do not have the opportunity of having colleges and universities aimed specifically towards Latino/a education. History has painted a harsh path for all minorities to obtain a higher education. During the 1860s, Historically Black Colleges and Universities began to give African Americans the opportunity of obtaining a higher education (Brown and Davis 2001). Although Historically Black Colleges and Universities could not give an opportunity to every African American student when they first opened, after the 1960s, African American involvement in higher education increased. Universities geared to specific minorities, similar to the case of African Americans in Historically Black Colleges and Universities, give the opportunity for minority students to obtain social capital to help increase opportunities in their future (Brown and Davis 2001). Following Historically Black Colleges and Universities, tribal colleges and universities also opened, aiming at Native American students. Although Native American higher education was overlooked for many years, in the 1960s the second tribal university opened (McClellan, Fox and Lowe 2005). Though the first tribal university opened during the 1850s, it was abolished by the American government. After the 1960s a strong movement began to call attention to Native American students, opening avenues of opportunity for them to obtain a higher education (McClellan et al. 2005). Yet there is no percentage of colleges or universities geared specifically towards Latino students. Latino parents of today's generation may not have been able to have as many opportunities as others to obtain a higher education, making it harder to share cultural and social capital with their children about what is needed to apply to college, how to obtain financial aid, what is the process of acceptance, or how is it to live in college. This may impact Latina decisions about college because important information about college, and role models already in college may not be able to be obtained.

Symbolic Interactionism Theory.

To describe the family, Symbolic Interactionists depict the family as a unit of interacting personalities (DeGenova 2008). Family members interact through a basis of symbols and meanings that socialize individuals as they grow up. Through this interaction, individuals learn roles such as father, mother, daughter, or wife. Once an individual is socialized into a role, he/she learns to "play" the assigned role (DeGenova 2008; Sandstorm et al. 2010). The behaviors and attitudes demonstrated by the "actors" resemble what they should be doing according to that role (DeGenova 2008; Sandstorm et al. 2010). As a result, our actions and feelings are determined by our environment and interactions with others (DeGenova 2008).

It is through the family that, as we grow up, we learn meanings and later attach those meanings to certain symbols. According to Symbolic Interactionists, we learn what we know through our environment (Sandstrom, Martin and Fine 2010). We form concepts and ideas through symbols and their interpretations and interactions relating to those same symbols (Ballantine and Spade 2008; Sandstorm et al. 2010). While growing up, we are able to connect words with meanings and finally visualize a concept (Sandstorm et al. 2010). The basis of these symbols that we learn is, therefore, the family. Through the family we learn meanings of others, and we also obtain a sense of who we are (Ballantine and Spade 2008). Meanings and symbols are also learned through other institutions, such as the school institution or the church institution, but the main socializer for most individuals is the family. The values that we have are learned for the most part through the family. The family, then, makes up a big part of what encompasses an individual.

The basis of what influences individuals to view and understand the world may be a factor as to how Latinas make their decisions whether or not to go to college. Latinas may be socialized and learn certain gender roles that may or may not af-

fect their decision of obtaining a higher education. Symbolic Interactionist Theory describes how individuals observe symbols and attach meanings to those symbols. Latinas may learn to view their environment a certain way according to their families' values and traditions and their environments. Some Latinas may learn the importance and value of higher education as they grow up, while others may not have this opportunity. It is important for Latinas to have a supportive family who appreciates and emphasizes education, thus emphasizing higher education. This is not only a support system, but it also encourages confidence in Latinas, making it less difficult for them to focus their attention on their academics.

The Latino family teaches and socializes the value of familism as children grow up (Contreras et al. 2002; Coleman et al. 2007). All families teach different values and traditions to their children; scholars (Contreras et al. 2002; Coleman et al. 2007; Villanueva and Buriel 2010) point to Latino families practicing the value of familism. Children see and experience interactions with their parents and siblings, creating relationships that lead to values such as obligations, duties, and unity to and within the family. If a family does not emphasize such values, children may not be able to learn it because they would not be around it or be able to experience it. Within the Latino family, familism is one of those values, as well as gender roles such as marianismo and machismo. As children get older, they may have certain obligations to their family due to the socialization process of what it means to help the family while growing up. The Latino family may value certain aspects of values and traditions higher than other families from other ethnic backgrounds. For example, Latino children often help their parents by translating; scholars refer to these children as "language brokers" (Villanueva and Buriel 2010). Sometimes, parents do not speak English well, and children do because they are able to learn it at school. Children help their parents by translating between them and other individuals, especially for parents who do not know English very well and have to deal with schools, medical affairs, landlords, legal authorities (Villanueva and Buriel 2010), or other social settings where English is the primary language. Research conducted by Villanueva and Buriel (2010) has shown that girls are often chosen as language brokers in the Latino family. This is due to gender roles emphasizing girls more emotionally attached to the family than boys, which is an example of the value of familism. Female children may feel obligated to help their parents when they need them, and in many cases, this may be through translating. This value of obligation and learning that parents may need help may be socialized and learned through the family. Symbolic Interactionist Theory posits that children learn what they know through different symbols and meanings. As female children see that their parents need help, they are socialized into the obligation of helping them through translation.

Furthermore, gender roles of marianismo and machismo are also associated with meanings and symbols as children grow up. Girls and boys mimic their roles in the family by interacting with their family members on a daily basis and building relationships with those interactions. In this way, children observe the meaning of the roles and the symbols attached to them. For example, children are able to see how their mom may stay at home cooking while the dad is at work. Eventually they are able to associate the symbols of cooking and housekeeping with mom and work or being outside of the home with dad. Young Latinas merge meanings with symbols, realizing that being women, they are supposed to be at home and not go to college. This may affect their decision whether or not to apply in the future. On the other hand, if young Latinas have a family support on higher education, it may be easier for them to go to college. Even if they may view the mother at home and they associate the meaning of mother with staying at home and taking care of the family, it may be more acceptable for Latinas to apply to college with family support for higher education. Support from the family for Latinas to obtain a higher education is also learned as children grow up as socialization occurs through the life course. With more support from the family for higher education, Latinas are able to do better in school. This may enhance their confidence and may encourage them to obtain a higher education.

In addition to family support on education, for Latinas to make the decision to pursue a higher education, the school institution may also play a large role. The school institution may not be a system that helps everyone reach the top nor encourage equality. Instead, it may be a way to separate individuals and put some in the top while placing others in the bottom, for example by rewarding upper class cultural capital (Kerbo 2009). Therefore, Latinas who may have a strong supportive family value system, and family values and traditions that encourage a college education, may feel more confident in pursuing higher education and later a professional career.

The school institution may also affect the decision about higher education. A symbolic interactionist perspective on how the school affects this decision-making process may include how as well as what students are learning in school. Cultural and social capital can be attained through the school institution. Additionally, Latinas may be able to associate certain symbols acquired in school to certain meanings that may later on lead them to the decision of whether or not to apply to college.

There are other factors affecting young Latinas decision to obtain a higher education, one of which may be stereotypes and how these influence individuals' views of themselves and how they decide their future. As part of the Symbolic Interactionist perspective, Labeling Theory explains how stereotypes, at times, become self-fulfilling prophecies. Expectations based on race, gender and ethnic background often affect how individuals make sense of their reality and how they interact with others (Ballantine and Spade 2008). For example, if teachers or professors utilize preconceived notions that Latina students do not appreciate education and do not try their best, teachers and professors are more likely to ignore them during class, call on them less, and grade their papers more harshly. This not only makes it harder for Latinas to finish with a good grade in that class, but it also discourages them from obtaining a higher level of education as they feel they are not good at school, leading to a self-fulfilling prophecy. Labels and stereotypes may impact the percep-

tions of many young Latinas, of themselves and of their future. On the other hand, stereotypes may also encourage young Latinas to obtain a higher education. It may be the case that these young women who are pursuing an education are doing so to prove stereotypes wrong.

Labels are learned through individuals' environments, including the home, school, church, or even through the media. The same way that stereotypes and labels are learned, racism is also learned through the process of socialization. To further understand the implications of racism in our societies at an institutional level and consider racism's role for Latina decisions about higher education, we turn next to Critical Race Theory.

Critical Race Theory

Although overt racism and segregation in academic institutions have been made illegal, the reality is that racialized practices continue to exist in academic institutions (Villavalpado 2004). Through the Critical Race Theory, we can better understand the practices, policies, and policy making of institutions that may make it harder for race and racism to disappear in our society (Villavalpado 2004). Critical Race Theory developed from legal scholarship in order to examine the persistence of racism in our societies (Delgado and Stefanic 2001; Aleman and Aleman 2010; Closson 2010). This theory explores how racism is socially constructed through interactions and relationships between individuals, thus pairing well with Symbolic Interactionist Theory. Symbolic Interactionist Theory is a way to understand the micro-level (individual level) of issues, for example, to understand how Latinas learn certain values and traditions as they grow up. Critical Race Theory is also a way to view issues more globally, on a macro level, allowing us to see how policies and practices affect individuals' values and traditions.

The core of the theory emphasizes how racism is institutional and systemic (Aleman and Aleman 2010). Racism is used by those in power to benefit themselves, and it may be a way to separate the lower classes (Kerbo 2009). Critical Race Theorists in recent years have focused on how race is used against different minority groups in response to shifting needs of the society, for example, in the labor market (Delgado and Stefanic 2001). Different minorities may be appreciated more or less according to the necessities of the labor market and what is needed in our society (Kerbo 2009). Critical Race Theory exposes institutions for their complicity in reproducing social constructs that are damaging (Aleman and Aleman 2010). Additionally, this theory locates racism as part of everyday operations; not only through individual acts, but amongst the main structure maintained by institutions in our society (Valdes, Culp, and Harris 2002). For example, racism is not only demonstrated at the individual level by a person making a racist joke, but also at the institutional level through the school by giving minorities a different type of education from that given to other students with higher socioeconomic statuses.

Furthermore, Critical Race Theory exposes how racism intersects with other forms of oppression such as sexism, homophobia and economic exploitation (Valdes et al. 2002; Delgado and Stefanic 2001). Critical Race Theory is a way to view how racism continues to prevail in our societies and that it is up to the individuals to make a change. An example to understand the Critical Race Theory through Latino/a experiences is policies and regulations that may affect Latino/as' chances to obtain a higher education. There are over sixty-five thousand students who are not able to continue a higher education in the United States, most of them are Latino/a (Dream Act Portal). Sons and daughters of illegal immigrants are in the United States because their parents brought them to this country when they were young and now find that they are not able to obtain a college education. Although there are some financial aid possibilities, these are only for U.S. citizens and residents. Young students who find themselves in this situation are not able to continue their education without the financial support. Many Latino/as who may want to continue their education after high school are not able to do so because they do not have the necessary financial support. These Latino/a students who are illegal in the United States have grown up in the American culture. They may have gone through the educational system, learned how to drive in the United States, and some students may even work. They have been socialized into American music, certain styles of clothing, and different slang only used in the United States. Students who have been brought to the United States at a young age may be fully socialized in the American culture.

The Development, Relief, and Education for Alien Minors Act, known as the Dream Act, aims to help illegal students who were brought by their parents to the United States obtain a higher education; but this act does not have full support from representatives of the United States Congress. Students and others supporting the Dream Act have tried to encourage Senators and House Representatives to pass this act and support students obtain a higher education. This proposition was presented to the government in 2006 (Dream Act Portal); four years later students continue to wait on a result. This proposition will in particular affect many Latino/a students. Involvement in higher education may be possible once the Dream Act is passed for many students who are today being excluded.

This barrier to many Latino/a students attempting to obtain an education, especially first-generation students, has a potential to turn into an opportunity. While many Latino youth are United States citizens, this policy affects those who are not. Through the Dream Act the lack of institutional support for Latinos to obtain a higher education is demonstrated. Critical Race Theorists may envision policies and practices by the government institution to support minorities to obtain an education. Passing the Dream Act would be one of them and an opportunity to obtain a higher education for Latino/a students. Other practices and policies for Latino/a students should be created to encourage students to obtain a higher education, for example, school counselors may communicate correct knowledge and information for Latino/as students about college and more scholarships aimed to this population, as well as training for school staff noting Latino culture within the school institution. Other policies and regulations to the Dream Act are explored by Critical Race theorists to acknowledge inequali-

ties that impinge opportunities for Latinas to obtain a higher education, such as the law prohibiting Latina American studies in high schools in Arizona, or repainting of murals in schools that have kids in the murals who look Latino.

Furthermore, in the school institution sexism and racism continue to affect students in achieving a higher education (Closson 2010). Researchers in the past (Knaus 2009; Closson 2010) have shown the complexity of learning environments. These environments may differ from urban to rural schools where the demographic make-up of the classroom may vary. Disadvantages and advantages faced by racial minorities like Latinos can be traced to differential educational achievement and attainment (Kao and Thompson 2003). Schools may differ in the type of curriculum and staff provided to teach. Some schools may focus on students obtaining a vocational future while other schools may focus on students going on to college after high schools. Schools that focus on students obtaining a college education in turn favor more advantaged students (Kao and Thompson 2003). The curricula taught in schools where more minorities from lower socioeconomic status attend compared to schools where higher socioeconomic status students attend are different. Students in higher socioeconomic statuses are taught to be more independent and autonomous, while students in lower socioeconomic status are taught to work together with others and conform to rules (Kozol 2005). The curriculum taught in schools may affect the decisions Latinas make on college enrollment. Students who are located in college preparatory curricula may be more likely to apply to college while students who are not in schools that enhance that curricula may not have such opportunities.

Scholars argue that assigning students in academic/nonacademic tracks and ability groups serves to reproduce inequalities (Kao and Thompson 2003; Ballantine and Spade 2008). The placement of students of low/high income and different races and ethnicities into different schools, or in different programs or courses within the same school makes it unequal for students to obtain the best education they could have and encourages division of classes, races, and ethnicities. In past research (Kao and Thompson 2003), low-income, urban schools have been shown to not offer the same courses that higher-income suburban schools offer. Additionally, differences in courses may also be affected by the teachers' perception on what to teach (Kao and Thompson 2003). Minority students are often placed in low-ability groups that may not focus on college preparatory courses, or college bound curricula that would be otherwise used to prepare students for college (Kao and Thompson 2003). Without guidance leading towards a higher education, it becomes more difficult for minorities, including Latinos, to pursue a college education.

In addition, Latinas, like most women, have to deal with a harsh environment in the classroom (Ballantine and Spade 2008; Kimmel 2008). Researchers have found that teachers interact differently with girls and boys in the classroom, giving boys the more challenging problems and identifying them as trouble makers. This brings boys more attention from the teachers, in comparison to viewing girls as quiet and passive, resulting in girls not having the same opportunities to participate in class (Ballantine and Spade 2008; Kimmel 2008). Latinas face a harsh reality when aiming to obtain a higher education and then a professional career resulting from an educational system that is not cooperative and encouraging. This may be one of the reasons why family values and traditions have a large effect on Latinas involvement in school and their goals and dreams. If there is no support for higher education from the educational institution for Latinas, the family institution becomes the primary and maybe the only source of support for higher education for Latinas.

As a result, Latinas may be faced with an educational system that does not support their culture or their gender. Latinas are not only a minority by being women but also an ethnic minority, which many times may lead to less interaction with teachers, less confidence to participate in class, less self-assurance to ask for help, and a lower sense of comfort with other students, amongst other things. The Latino culture may not be well accepted in the educational institution. This makes it complicated for Latinas to feel a sense of belonging in the educational arena. In some cases, teachers may not expect Latinas to be able to obtain a higher education due to stereotypes and low expectations; therefore, they may treat Latinas differently in the classroom and may not challenge their abilities and skills. There are always the stereotypes that may chase Latinas through their educational careers, such as pregnancy, contracting genital diseases, or simply not being smart enough. A better sense of acceptance in the schools of the Latino culture may be an avenue of opportunity for Latina students to continue their education after high school. More correct information and knowledge about college may also be an opportunity for Latina students to attain a higher education.

Latinas, like most ethnic and status minorities, may attend lower income urban schools. Urban schools may not receive the same funding as other non-urban or private schools. Therefore, schools that are attended for the most part by Latinas are not able to provide the quality education that other schools may have. Since there is less funding, extracurricular activities and drop out prevention programs may not be fully funded. The teaching staff is not equally certified as teachers in higher income suburban schools. Primarily, the didactic materials these young girls are learning are not equal to those of higher income students. Their preparation for college may not correspond to the education received in a higher income school because the schools teach different curricula in different demographic areas.

Due to constraints of socioeconomic status, sexism, discrimination, and racism in the educational field, Latinas are in need of a strong supportive system both in the school and in their families that will encourage them to obtain an advanced educational career. If this support system is missing, it makes it harder for Latinas to continue their education. Symbolic Interactionist Theory helps us understand how individuals are socialized into different values and traditions and gain cultural and social capital. Cultural and Social Capital leads us to understand how knowledge and skills are learned and passed on from

our environments, and Critical Race Theory helps us to understand how society's institutions may provide opportunities or barriers to certain individuals. Together, these theories have led us to better process, analyze, and understand the Latina experience in education and their homes.

RESEARCH QUESTIONS

In this project, I will address two main research questions. First, *How do family values and traditions affect eighteen to nineteen year old Latinas' decision-making process on going or not going to college?* Scholar attention (Monkman et al. 1990; Hernandez 1995; Hurtado-Ortiz and Gauvin 2007; LeCroy and Krysik 2008; Valverde et al. 2008; Carranza, You, Chhuon, and Hudley 2009) has focused on the Latino experience in education, but not much research has focused on the Latina experience in education and how this may be affected by her role in the family. There may be various reasons for the lack of enrollment of Latinas in higher education, one of which may be the family. Family helps shape individuals' views and expectations. Furthermore, family values and traditions may be a basic indicator of what is encouraging or restraining these young women from breaking the mold and fighting stereotypes by obtaining a higher education. In this study, I will investigate how family interactions and relationships may affect this decision-making process for young Latinas. Additionally, past literature (Hernandez 1995; Gonzalez et al. 2003; Gonzalez et al. 2004; Olive 2008) focuses on the barriers that Latino/as encounter to obtain a higher education. While I will note whether these barriers are present, I instead focus my project on the avenues of opportunities that Latinas encounter that may help these young women to pursue a higher education.

Second, I ask, *How does the school institution affect the decision-making process of Latinas' college enrollment?* The Latina experience in school may also be important in the decision-making process of Latinas. How the Latino culture may be acculturated or clash with the educational arena may affect the future of many young Latinas. Incorporating Latino culture in the school institution may help Latinas feel more comfortable in the school environment and may affect their decision as to whether or not to continue their college education. Learning experiences and environments amongst individuals may be different and may affect their decision-making process of college enrollment. The purpose of the current study is to further understand the Latina experience in the educational institution; in addition to young Latinas' family values and traditions, specifically how these affect the decision-making process on college enrollment. This research question will be explored to help uncover the opportunities that educational institutions have to offer to Latinas to help them obtain a higher education.

DATA AND METHODS

In order to address whether family values and traditions of eighteen to nineteen year old Latinas affect their college enrollment decision-making process, and to investigate how educational institutions affect this decision, I use both quantitative and qualitative data. Employing both methodologies allows a better understanding of the Latina educational experience and how this may be affected by family values and traditions. Quantitative data provide a clear demographic picture of the Latina experience in education nationwide, while qualitative data provide more in-depth information about the Latina experience with the family and the educational institutions. The study's quantitative section provides depth of understanding and context for the qualitative analysis of the study and gives more weight to the information gained. Dual methodologies are used in this research to contribute to literature on this topic and further our understanding of the factors that affect young Latinas's decision-making processes on higher education.

Quantitative

In order to provide a national picture of young Latinas of high school age, I employ secondary data from the National Center of Education Statistics titled the Education Longitudinal Study (2002). In the Education Longitudinal Survey, over 15,000 high school sophomores (tenth grade) participated in the study by filling out surveys in 2002. Study participants included 752 randomly selected public and private schools, helping to make this data on high school students nationally representative. Students were assessed in the year of 2002 and follow-ups with the same students were assessed during their senior year in 2004. This data set also includes dropout and transfer students, who were tracked in order to obtain follow up information (ELS 2002). This data provide descriptive statistics that demonstrate the rate of young Latinas' school involvement and how their parents and teachers believe they interact with school. I also provide a picture of the students' interactions and relationships with their parents and teachers from the students' perspectives and incorporate demographic information from high school Latinas and how they view their educational experiences.

Variables used for this project include student sex, student race, individuals who provided college information, close relatives' desires for students' post-secondary careers, how often a student discussed college with her parents, the parents' highest obtained level of education, the importance the student placed on education, whether the student felt her teachers praised effort, parents' aspirations for their child's education, the student's educational aspirations, the level of parents' understanding of spoken English, parents' satisfaction with their child's education, the importance parents placed on their child living at home while she pursued post-secondary education, students' beliefs that teaching is good at their school, students' beliefs that teachers are interested in students, whether students attended a bilingual/bicultural class, whether English is the students' native language, students' beliefs that teachers expect them to succeed in school, teachers praise student effort, and students' attendance in a college preparation program. For this project, I filtered the data to include only Latina female students[1] to understand their high school experiences and the factors leading them to make decisions for their future. The sample size of Latinas is N=1121. Parental involvement and expectations are also included, along

[1] Excluding analysis in Chart 1.1, which includes all students enrolled in tenth grade year in 2002, and Chart 1.2, which includes all female and male Latino students enrolled in tenth grade year in 2002.

with teacher influences that may or may not impact Latinas' college decision-making process. Using these data, the results are generalizeable to the national population of Latina women enrolled in tenth grade in 2002. These data are particularly relevant today and to my research questions because the participants who decided to continue their education in college may have finished obtaining their college degrees now. This is directly relevant to the qualitative data conducted in 2010 and allows me to see if the experiences of Latinas today may be similar or different from the experiences of Latinas in 2002.

Qualitative

All participants (n = 8) involved in the qualitative interviews were Latina women specifically eighteen to nineteen years of age because this is the age when most students are faced with the decision to enroll in college. Six participants were in college. One participant had just graduated from high school and decided to apply to college. One participant was not in college but wanted to obtain a college degree in the future. For the purpose of this study, it was important that the participants identified themselves as Latinas. What it means to be a Latina may vary, but doing so places emphasis on the cultures from Latin American Spanish-speaking countries, such as Mexico, Guatemala, Puerto Rico, Peru, or El Salvador. The women who volunteered to complete the interviews were contacted through nonprofit community based organizations that mainly focus on Latino/Hispanic affairs. These organizations were informed of the purpose of the study, and they referred the correct information to the women who participated. Women were also contacted at supermarkets, Laundromats, and local businesses in the Latino community. They were informed about the project; if they were interested, their contact information was shared with the researcher, and interviews were conducted later.

Snowball sampling was also utilized to obtain participants for involvement; participants referred others who might be interested in volunteering for the study to the researcher. The sample is small, nonrandom, and nonrepresentative. As a result, these qualitative data are not generalizeable; rather, they are used to provide more detailed information about the Latina experience in education and the family value system. The women's participation was fully voluntary, and their identities are kept confidential for their own protection. Prior to the contact and recruitment of the participants for this study, Institutional Review Board approval was obtained through the researcher's home university.

One-on-one interviews were conducted with the participants and lasted from thirty to sixty minutes. Interviews were conducted in both English and Spanish and later translated into English. Notes taken during the interviews were transcribed immediately afterwards. In addition to demographic information about interviewees, their experiences in school and family structure were explored through a series of open-ended questions. The questions were designed to elicit an understanding of what is important to these young women and how they perceive their experiences in their family and education. These interviews allow for a better understanding of the roles Latinas are learning in their families, their values and traditions, and how their interactions with family members affect their college enrollment decision-making process. Interviews also allowed for investigation of women's perceptions of the school institution, if they had enough information about college, and how their relationships with their teachers affected their decision-making process. Additionally, the question of, "What do you believe are some barriers for Latinas to obtain an education?" and, "What do you consider are some opportunities for Latinas to obtain an education?" were asked to obtain information not only from their personal experiences in the educational system but also their perceptions of their environments. Interviews were content coded into themes and analyzed. The themes that were relevant were family, college, and the decision-making process. These themes included participants' points of view along the following dimensions: participants' goals and dreams, parental support, family values, family traditions, family unity, parent communication, family roles and obligations, parental expectations, teacher support, school access for college information, school diversity, school participation, participants' role models, close friends going to college or not, barriers to obtaining a higher education, opportunities to obtaining a higher education, and the pay-off of attaining a college education.

Analytic Strategy

Descriptive statistics were conducted to depict a clear picture of the population, 1121 Latina female students. They include demographic information about the schools participating in the Education Longitudinal Study in 2002, using the following variables: racial composition, gender composition, parental level of education, and English as the native language. Cross-tabulations were conducted with variables to glean a better understanding of Latinas' family values and traditions as well as the role of the educational system. Correlations were run to investigate the relationship between specific variables and what may be some of the factors leading to the decision for Latinas to obtain a higher education. Additionally, for the qualitative interpretation of the results, I coded the interviews into different themes that are affecting Latinas' decision-making processes. The coding schema was related to relevant dimensions explored during the interviews to understand the decision-making process of young Latinas. Family and school experiences were examined along with the participants' goals and dreams. Opinions on barriers to obtaining a higher education and opportunities for continuing their education after high school were also examined.

RESULTS

Schools in the United States are filled with students of different genders, races, ethnicities, and socioeconomic status. The national racial composition of tenth grade high school students in the United States during 2002 indicated that 14.5% of all students were Latino (see Chart 1.1). Of the Latino students, 49.5% were female (see Chart 1.2). Out of all Latina students who were in tenth grade in 2002, 47% spoke English as their native Language (See Appendix). To make a decision about one's future is difficult for any teen. But how are Latinas deciding whether or not to obtain a college education? Through this project, I analyze how and if their family values and traditions play a large

role, and how the school as an institution plays a role in this decision.

Correct knowledge and information about college may be critical when making the decision of whether or not to apply. The individuals who these women go to for college information about college may have a great influence on this process. These young women may be going to different individuals to obtain information about college (see Table 1.1). Some have gone to their school counselor (45.3%), to their teacher (37.1%), and to their coaches (5.4%). However, most women are reaching out to their families about college information. Seventy-six percent of women identify that they ask family members for college information. Therefore, the family may play a very significant role on Latinas' decision-making process for their academic future. The family as well as the school institution may affect significantly the type of information Latinas obtain about college and their decisions for their future.

Family

Parents, siblings, and other family members may have a great influence of how much Latina students value education. Cultural and social capital about college may be passed on to Latina students from different family members. Latinas may also learn the importance of obtaining a higher education from their close relatives and family members. This may demonstrate the shift from traditional roles to nontraditional roles for Latinas. According to the Education Longitudinal Study data, as shown in Chart 1.3, 77.3% of Latinas' close relatives want them to go to college. This is significant because, although some of the relatives may not have a college education, they continue to value education since they want the student to continue their education after high school. Additionally, most students have discussed going to college with their parents; 50.8% of the Latina students said they talk to their parents often and an additional 40.2% of students said they talk to their parents sometimes (see Chart 1.4). This may possibly demonstrate the value of familism, parental support and how much Latinos do value education given that 91% of women are turning to parents for support and advice about college.

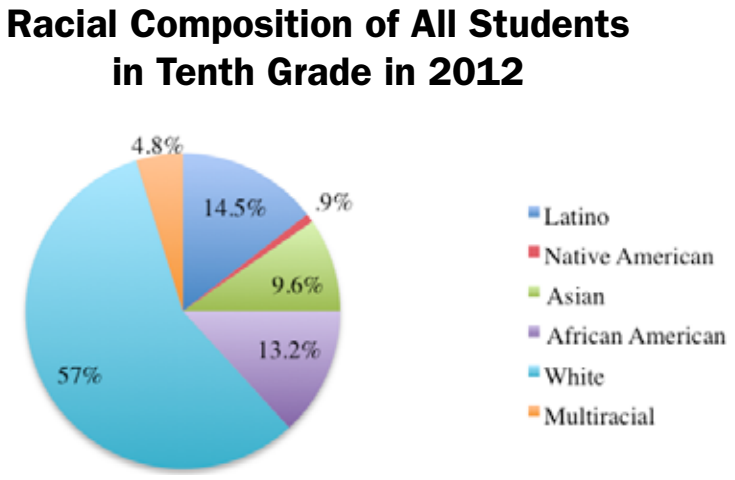

Chart 1.1 (ELS 2002)

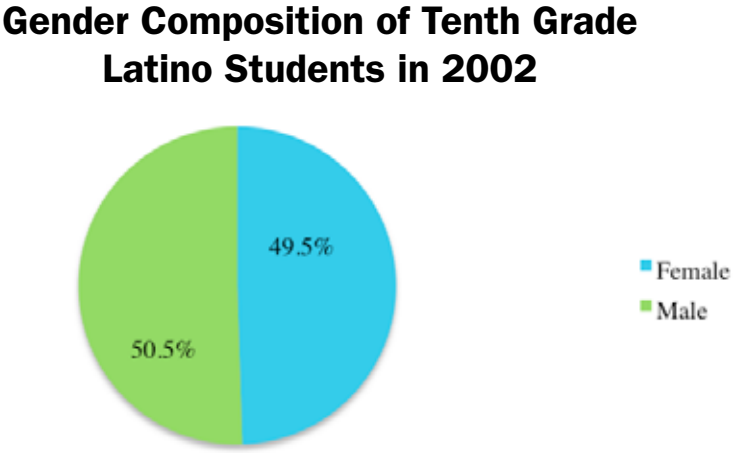

Chart 1.2 (ELS 2002)

	Parent	Sibling	Teacher	Counselor	Coach
Yes	50.6%	25.4%	37.1%	45.3%	5.4%
No	49.4%	74.6%	62.9%	54.7%	94.6%

Table 1.1 Individuals that Latina students have gone to for college information in tenth grade

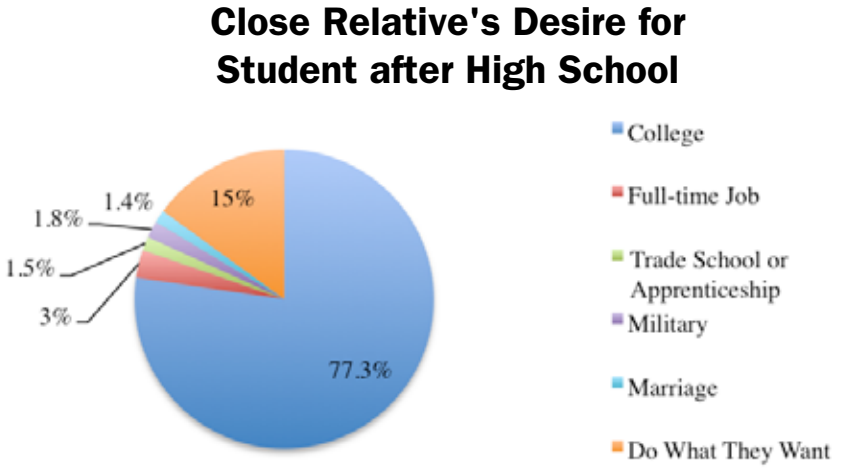

Chart 1.3 (ELS 2002)

To gain a better picture about how Latinas' family values and traditions may affect their decision-making process, a crosstabulation of how often students discussed going to college with their parents and the parents' highest level of education was conducted. The results indicate that, no matter their parents' level of education, most students (90%) are discussing college with their parents, (see Table 1.2). The results also indicate that most of the parents (60%) did not pursue a college degree, but they are still encouraging their daughters to obtain a higher education or at least are discussing the idea with them.

During the qualitative interviews conducted as part of this research project, participants mentioned how family closeness and unity are very important in their families. When asked if they considered their families to be close, most of the participants explained that they felt their families were very close. "We are very close we are always there for each other" (Interviewee 6). One of the participants said that she was not very close with her family because she had moved out of the home. The same participant mentioned how she misses her family and wishes she could be close with them again. Another participant said, "My immediate family is very close, but I was closer with her cousins when I was younger, our interests have changed…. I'm in school" (Interviewee 3). Latinas mentioned how communication with their parents is very important. One of the participants mentioned how her communication with her parents has grown as she has gotten older. "I tell them everything even if they don't want to hear it" (Interviewee 1).

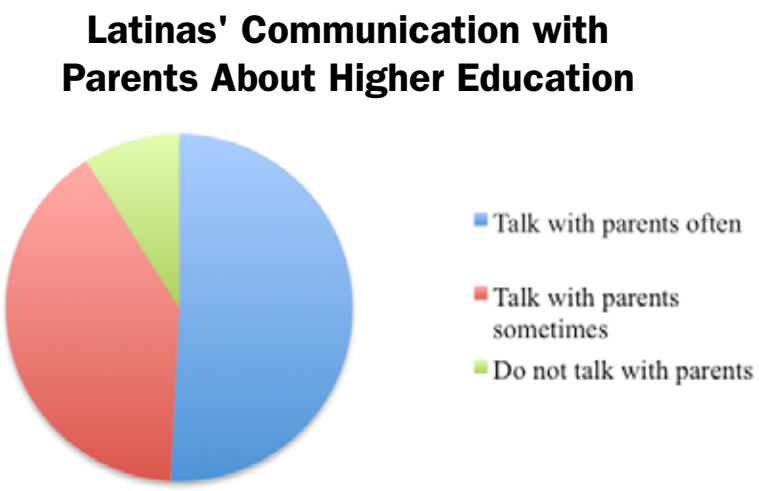

Chart 1.4 (ELS 2002)

Parent's highest level of education	**How often child discussed going to college with their parents**			
	Never	*Sometimes*	*Often*	*Total*
Did not finish high school	1.8% (16)	8.9% (77)	8.9% (77)	19.7% 170
Graduated from high school/GED	2.9% (24)	9.1% (79)	9.3% (81)	21.3% (184)
Two year school, no degree	1.2% (10)	4.7% (41)	5.9% (51)	21.3% (184)
Graduated from a two year school, no degree	.8% (7)	4.2% (37)	3.7% 32	11.8% (102)
Attended college, did not complete	1.4% (12)	4.3% (42)	6.6% (57)	8.8% (76)
Graduated from college	.9% (8)	4.9% (43)	8.2% (71)	12.9% (111)
Completed a Master's degree	.1% (1)	1.8% (16)	3.2% (41)	14.2% (122)
Completed PhD, other advanced degree	0% (0)	1.2% (11)	3.4% (28)	6.7% (58)
Total	9% (78)	40% (346)	50% (438)	100% 862

Table 1.2 Crosstabulation of "Parent's highest level of education" and "How often the child discussed going to college with their parents"

Crosstabulations of how far in school parents want their child to go and how far in school the student thinks she will get were also conducted (see Table 1.3). The majority of the participants, both parents and daughters, agreed that graduating from college was their primary choice (78%). Most parents want their daughters to obtain at least a two-year college education. Similarly, most daughters want to pursue at least a two-year education. Contrary to stereotypes, this demonstrates how Latinos do value education. In addition, several correlations were conducted to understand the secondary data on how family values and traditions may affect the decision-making process of young Latinas regarding college.

		Importance of getting a good education			
		Not Important	*Somewhat Important*	*Very Important*	***Total***
Teachers Praise Effort	*Strongly Agree*	0% (0)	.7% (7)	19.5% (193)	20.2% (200)
	Agree	.2% (2)	4.5% (45)	44% (436)	48.8% (483)
	Disagree	.1% (1)	3.8% (38)	24.0% (238)	27.9% (277)
	Strongly Disagree	0% (0)	.6% (6)	2.4% (24)	3% (30)
Total		.3% (3)	9.7% (96)	90% (891)	100% (990)

Table 1.2 Crosstabulation of "Parent's highest level of education" and "How often the child discussed going to college with their parents"

	How far in school a parent wants their child to go						
How far in school a student thinks they will go	*High school graduate/ GED*	*Two year college*	*Four year college incomplete*	*Graduate from college*	*Master's degree*	*PhD or other advanced degree*	***Total***
Less than high school	.1% (1)	0% (0)	0% (0)	.8% (8)	.1% (1)	.5% (5)	1.5% (15)
High school/ GED	1.3% (13)	1.6% (16)	0% (0)	3.2% (31)	.8% (8)	1.4% (14)	8.3% (85)
Two year college	.2% (2)	.7% (7)	0% (0)	2.4% (24)	.6% (6)	1% (10)	5% (49)
Four year college incomplete	.2% (2)	.6% (6)	.1% (1)	2.3% (23)	.8% (8)	1.4% (14)	5.5% (54)
Graduate from college	1.3% (13)	1.3% (13)	.2% (2)	17.5% (172)	7.9% (78)	10.4% (102)	38.7% (380)
Master's degree	.4% (4)	.3% (3)	.1% (1)	7.3% (72)	5.4% (53)	7.1% (70)	20.7% (203)
PhD or other advanced degree	.3% (3)	.1% (1)	.1% (1)	5.7% (56)	3.6% (35)	10.6% (104)	20.3% (200)
Total	3.9% (38)	4.7% (46)	.5% (5)	39.3% (386)	19.2% (189)	32.5% (319)	100% (983)

Table 1.2 Crosstabulation of "How far in school a parent wants their child to go" and "How far in school a student thinks they will go"

Correlations between how far in school a student thinks she will get and how well her parents understand spoken English are statistically significant (b = .243, p ≤ .01), which indicates that the relationship is positive and it is not due by chance (see Table 1.4). However, it should be noted that the relationship is weak. One of the reasons for this weak relationship may be the result of be other variables influencing the outcome, for example, the respondent's socioeconomic status[2]. This relationship is important because it demonstrates that a student is able to obtain cultural and social capital from her parent, and that the parent may or may not be able to communicate with the school regarding opportunities for the student's future. Another possibility for the weakness of the relationship may be that the parents' native language may not interfere that greatly with Latinas' college decisions. It may be true that since the student already speaks English fluently, she may not need her parents to obtain the correct information.

		How far in school a student thinks they will get	How well parent understands spoken English
How far in school a student thinks they will get	*Pearson correlation*	1	
	Sig.		
	N	983	
How well parent understands spoken English	*Pearson correlation*	.243**	1
	Sig.	.000	
	N	475	539

**p ≤ .01

Table 1.4 Correlations between "How far in school a student thinks they will get" and "How well parent understands spoken English"

		How far in school a student thinks they will get	Parent satisfaction with their child's education
How far in school a student thinks they will get	*Pearson correlation*	1	
	Sig.		
	N	983	
Parent satisfaction with their child's education	*Pearson correlation*	.144**	1
	Sig.	.000	
	N	848	966

**p ≤ .01

Table 1.5 Correlations between "How far in school a student thinks they will get" and "Parent satisfaction with their child's education"

Next, correlations between how far in school a student thinks she will get and parent satisfaction with their child's education were run. There is a positive statistically significant relationship found between these two variables (b = .144, p ≤ .01). This statistically significant relationship demonstrates the association between the importance of education to parents and their plan for their child's future. This may be related to how students are learning the importance of education as they grow up, as symbolic interactionist theorists demonstrate, and the passing on of cultural and social capital. However, this relationship is also weak (see Table 1.5), which may be due to the effect of other variables also affecting the students' desire for their future after high school. It is also a possibility that the parents' satisfaction with their child's education is not the most significant factor affecting Latinas' decisions about higher education.

Additionally, it may be harder for parents who were unable to obtain an education to realize the quality of education that their child is obtaining. Regarding the national data, parental satisfaction with their child's education may also depend on the level of education the parent has obtained. Clarity on this issue may come from the qualitative interviews. All of the women who participated in the qualitative interviews were first generation students, either in college or going to college. Even though their parents did not have a college education, the interviewees received their parents' full support. The value of education in Latino families was reflected throughout the interviews. "My parents have always pushed me to go to college, they are very supportive" (Interviewee 2). "Where I come from, not a lot of people have a college education. If I don't want to be like them, I have to go to college and their (parents') values pushed me to go further" (Interviewee 7). Parental support for their daughters to pursue education after high school may also be perceived through variables that demonstrate other values in the Latino family; living at home may be one of them.

Parents who push their daughters to obtain a higher education may be more understanding of their daughters living on campus or near their universities outside of the home. Understanding of a college education can therefore, be demonstrated through the relationship between the parents wanting their child to obtain a higher education and parents wanting their child to stay at home after high school. On the one hand, it may be possible that parents want their daughters to stay in home to protect them; on the other hand, it may be possible that parents want their daughters to move out so they can pursue a higher education and become independent.

Correlations between how far in school a student thinks she will get and living at home while attending post secondary school were also conducted. There is a negative statistically significant relationship between these two variables (b = -.165, p ≤ .01). As the student wants to

[2] Further analysis indicates that control for socioeconomic status does not affect the statistical significance of this relationship, however, the possibility of other variables affecting or mediating results still remains.

continue her education, parents are more understanding of her living outside of the home while attending college (see Table 1.6). The value of familism, family closeness and unity, may be reflected in the parents' desire for their child to stay at home. But we should also note that this relationship is weak. There may be various reasons why this relationship is weak, for example, the area where the student lives: she may live near a well-known college or university, and staying at home may be her best option. Other factors that may affect this relationship may be how much the student contributes to her family or her family obligations.

Puzzling results from qualitative data contradict the quantitative results. Women who participated in interviews for this research all mentioned they felt great support from their families for obtaining a higher education; six out of eight lived at home with their parents. Most women who lived at home with their parents lived relatively close to their universities, at the most 20 minutes away. One of the women who did not live with her parents lived on campus, and her parents lived a few hours away. The other woman who did not live with her parents lived with her boyfriend. It is a possibility that women from the national data have little access to colleges and universities near their family's homes. This may be a reason why there is a relationship within women from the national data set whose parents demonstrate support for them living outside of the home and their parents wanting the daughters to obtain a higher education. Women who participated in the qualitative interviews and lived with their parents felt large support from their families to obtain an education.

All of the women mention how their primary family obligation includes being there for their family and supporting each other. "It is a common understanding that we are there for each other" (Interviewee 3). "Help around the home and with whatever they need me" (Interviewee 5). One of the interviewees mentioned how she helps her family financially: "I help them with money, nothing too dramatic" (Interviewee 4); she said that she helps her family as much as she is able. The traditional value of familism may be reflected through the family unity described by the participants. Unexpectedly, the traditional roles of Marianismo, so highly talked about in past literature, were not reflected in the interviews for this project, as the interviewees did not relate to them.

		How far in school a student thinks they will get	**Living at home while attending post secondary school is important to the parent**[3]
How far in school a student thinks they will get	*Pearson correlation* *Sig.* *N*	1 983	
Living at home while attending post secondary school is important to the parent	*Pearson correlation* *Sig.* *N*	-.165** .000 753	1 853

**p ≤ .01

Table 1.6 Correlations between "How far in school a student thinks they will get" and "Living at home while attending post secondary school is important to the parent"

		How far in school a student thinks they will get	**Parents' highest level of education**
How far in school a student thinks they will get	*Pearson correlation* *Sig.* *N*	1 983	
Parents' highest level of education	*Pearson correlation* *Sig.* *N*	.224** .000 983	1 1121

**p ≤ .01

Table 1.7 Correlations between "How far in school a student thinks they will get" and "Parent's highest level of education"

In addition, correlations between how far in school a student thinks she will get and parents' highest level of education were conducted. There is a positive statistically significant relationship between these two variables (b = .224, p ≤ .01). As the student's desire to obtain a higher level of education increases, her parents' level of education also increases (see Table 1.7). This relationship may demonstrate the passing on of cultural and social capital. Further, the use of Symbolic Interactionist Theory might show how students learn meanings from their parents and their environments. While this relationship is statistically significant, we must also remember that the strength of this relationship is weak. One of the various reasons for this weak relationship may be because, although cultural and social capital about higher education

[3] Coding of the variable "Living at home while attending post secondary school is important to parent" and "How far in school a student thinks they will get" is opposite. As a student wants to pursue a higher degree of education increases, their parents are less likely to want them to stay at home, which is why it shows the p-value is negative. This symbolizes how, as parents are more understanding of their daughters going to college, they are more likely to support them by agreeing that they can live outside of the home.

may not be able to be transmitted if parents do not have a higher education, it may also be an incentive for students to obtain a higher education. A lot of women may view their parents' experiences as learning opportunities and want better ways of life than what their parents had.

During the interviews, one of the questions asked was, "What encouraged you to obtain a higher education?" One of the respondents answered, "wanting more than what my brothers and parents achieved" (Interviewee 1). Although the participant was unable to obtain the correct knowledge and information about college from her immediate family, she used their experiences as an incentive for obtaining a higher education. During the interview, she mentioned how she has seen her mother and father struggle and she did not want to have a similar experience. It is also possible that some students may use their parents' experiences as guides to lead their own lives. The participant who was not in college mentioned that her goals and dreams are to have a family and children.

Most of the women who were interviewed were first generation students, either in college or going to college. Only one of the participants' parents had a college education, and another participant was not going to college. Parents' satisfaction with their child's education may also depend on the level of education the parents have attained. If the parents have not obtained an education, it may be harder for them to realize what type of education their child is obtaining because they may not have anything to compare it to. The interviewees who were in college or planning on going to college received full support from their parents on obtaining a higher education. Their parents have pushed them to continue their education. When asked, "What are your parents expectations from you?", one of the respondents answered, "To go to college" (Interviewee 4), while another answered, "To be independent and obtain an education" (Interviewee 5).

Moreover, regarding how Latinas' family values and traditions affect their decision-making processes about higher education, the qualitative interviews conducted with 18- to 19-year-old Latinas also provide more meaning to the secondary data. Participants were able to share their personal experiences, giving us more rich and detailed information about Latinas' family values and traditions and how these affect their college-related decision-making process. Surprisingly, all participants had a very hard time describing their family values and traditions. Seven out of eight participants agreed that their main family value is family togetherness and the sense of family unity. This may be another demonstration of the value of familism in the Latino family, while the eighth participant mentioned that her main family value is education. Many Latino families and Latina students highly value education, which is reflected by one of the participants in the interviews.

One of the participants described that sense of family unity as follows: "It is that unconditional love … when my older brother got in trouble, I was disappointed … but no matter what, he is my brother so I have to be there for him, I went to see him every weekend when he was locked up, that shows our togetherness … we would all go see him every weekend" (Interviewee 1). Another participant described her family togetherness as being there for each other; when her parents were sick and had to move out of the state, she decided to move with them to help them as much as she can. "Whatever they need me to do I'll be there" (Interviewee 4).

Additionally, when asked, "What are your family obligations?", all participants answered, "to be there for one another" as part of their response. All of the participants mentioned how they do not have any set obligations; they help when they are needed, and they try to focus mostly on their education. "All I have to do is focus on my education and work... cuz I'm the youngest and only girl, so I am spoiled… Sometimes I translate for my grandparents when they come visit and I take them to doctors' appointments, I drive them everywhere" (Interviewee 1). "I am trying to be a good role model for my sister" (Interviewee 5).

Parental expectations were also explored through these interviews. All the respondents mentioned how their parents want them to be independent. When asked, "What are your parents' expectations from you?", one of the respondents answered by saying that her parents trust her a lot, and that they expect her to be more responsible than the average 19-year-old: "They expect me to do the right thing" (Interviewee 3). Another respondent answered that her parents expect her to "go to college, support myself and become independent" (Interviewee 4). Nontraditional roles were present within the parental expectation of the Latina interviewees, and most of the participants were encouraged to become independent and obtain a higher education.

Most interview participants did not consider their family a "traditional" family. One of the participants is biracial, and her family members practice various religions. She mentioned that this may be an explanation for why she does not consider her family to be traditional. Another participant's parents are on their second marriage and have stepbrothers and stepsisters, which is why they do not consider their family to be traditional. Three of the participants believed her family to be very traditional because it is composed of the mother, the father, and the children. Most participants did not consider their family to be traditional because they did not have the "typical" nuclear family and their parents had been married or divorced more than once.

Most participants depicted their family traditions as music, food, and holidays. Participants were asked to identify both their own traditions and their family traditions. All participants agreed that their traditions are the same as their family's traditions. One of the participants also mentioned relationships with family and friends. Another participant mentioned visiting family as one of her main traditions. "We visit each other during the year, because I have family members in different states" (Interviewee 4). This may depict the value of familism present within the Latino family. It can be tentatively concluded from this insight that, while family traditions may not have a large impact on the decision-making process of college enrollment for Latinas, the family value of familism is present. Family may be a way for Latinas to obtain cultural capital. It is possible that the cultural capital needed to make the decision regarding college may be more noticeable through family values.

When Latinas are considering whether to enroll in college, other factors may be very important as well, one of which is the role that the school may play as an institution.

EDUCATION

In a way, the educational system shapes the future of many young students. The relationship among school staff, teachers, and students may be important to Latinas' college decisions. According to Latinas who participated in the Education Longitudinal Study in 2002, over 80% believe that their school provides good teaching (combining students who strongly agree and agree; see Chart 1.5). The quality of education a Latina receives could impact whether she applies to college or not. Additionally, 79.1% of Latinas believe their teachers are interested in students (combining categories of Strongly Agree and Agree; see Chart 1.6). This may affect how Latinas shape their future, as they have someone they may comfortably relate to and reach out to for information. Latina students may also view teachers as role models. Latinas' perceptions about their teachers may affect their view of them as role models.

To gain a better image of the relationship between teachers and Latina students in U.S. schools, a crosstabulation was conducted between the variables of "Teachers praise students' effort" and "Students' belief in the importance of getting a good education." Overall, most students (63.9%) believe that teachers praise student effort (combining students who agree and strongly agree; see Table 1.8). Regardless of students' opinions on teachers praising their effort, 90% of Latina students value education as very important, and 9.6% of Latina students value education as somewhat important. Only 0.3% of students view education as not important. These findings are very important because they demonstrate that, even if the students do not feel that their work is being valued, they continue to place importance on education. This may demonstrate that Latina students learn to value education outside of the school, relying on other institutions for this support. The students who feel that their teachers do not praise their efforts in

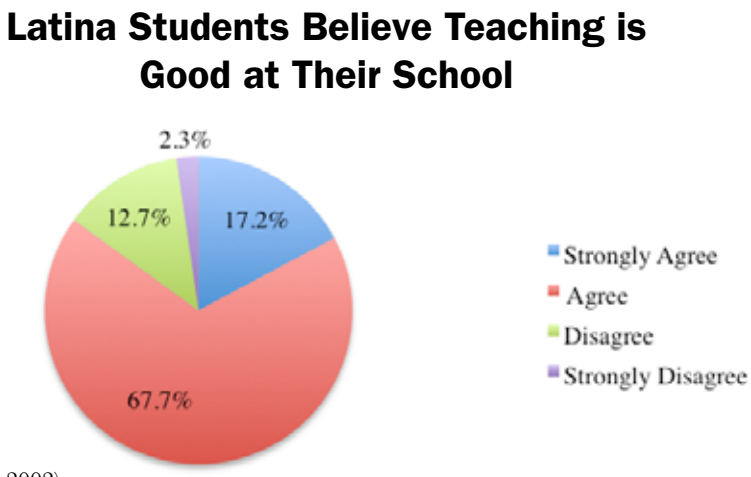

Chart 1.5 (ELS 2002)

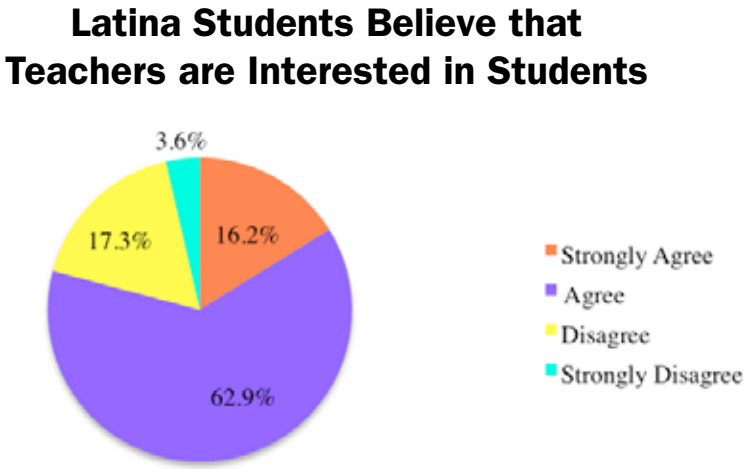

Chart 1.6 (ELS 2002)

		Importance of getting a good education			
		Not Important	*Somewhat Important*	*Very Important*	***Total***
Teachers Praise Effort	*Strongly Agree*	0	7 .707%	193 19.49%	200 20.2%
	Agree	2 .202%	45 4.54%	436 44.04%	483 48.78%
	Disagree	1 .101%	38 3.83%	238 24.04%	277 27.97%
	Strongly Disagree	0	6 .606%	24 2.42%	30 3.03%
Total		3 .303%	96 9.69%	891 90%	990 100%

Table 1.8 Crosstabulation of "Students belief that teachers praise student effort" and "Importance of getting a good education" (ELS 2002)

school may demonstrate the portion of Latina students who attend schools where the aim of policies, practices, and regulations do not assist Latina students in obtaining a higher education.[4] To explore whether the school institution specifically aims to help Latinas continue their educational careers, a crosstabulation between the variables of whether English is the student's native language and if the student has ever been in a bilingual/bicultural class was conducted.

Slightly more than half (53%) of the Latinas who participated in the Education Longitudinal Study do not speak English as their native language. Most of those Latina students (68.7%) did not participate in a bilingual/bicultural class (see Table 1.9). There may be various reasons for this lack of participation in bilingual/bicultural class. For example, some of the schools may not offer a bilingual/bicultural class, or there may be policies or regulations prohibiting them. It is possible that Latina women simply decided not to participate in bilingual/bicultural classes even if their schools offered them. However, offering such classes may help students who do not speak English as their native language and encourage them to continue their education after high school. The relationship and communication among Latina students, their parents, and school staff may have a large impact on the decision-making process of young Latinas. Several additional correlations to understand the Latina experience in the educational institution were also conducted.

Correlations between "How far in school a student wants to go" and "Teachers expect success for the student in school" show a positive statistically significant relationship between these two variables (b = .145, $p \leq .01$; see Table 1.10). Expectations from teachers may also influence Latinas' college decisions. It is possible that teachers expecting Latinas to go to college share information with them about college, and that Latinas with teachers who expect them to go to college feel more support to pursue higher education. Teachers' interactions with students is very important because, as Critical Race Theory suggests, teachers may carry out the schools' practices and regulations. It may be difficult to capture practices and regulations through teachers' expectations for their students' success, which might explain the weakness of the relationship. Other reasons for the weak relationship may result from other variables, for example, the students' age, the school (whether it is urban or suburban), or even socioeconomic status. This relationship may possibly be affected by teachers as role models, which may have a large impact on Latinas' post-secondary decision-making process. Latinas' choice of role models may indicate how they want to see themselves in the future. Teacher impact may affect Latinas' decision-making processes as well. When asked about their role models, only one of the participants from the qualitative interviews viewed her teachers and other school staff as her role models. "My role models are my high school band director and one of my advisors. Both are very good teachers and good people, I want to be like them" (Interviewee 3). She went on to say that her brother and sister had also greatly influenced her. Although Latinas appreciate their teachers and view them as good teachers, their influence may not be very significant for their college decisions. When asked, "Who are your role models?", most participants answered that it was their mother or their parents. One of the participants answered as follows: "My mom is my role model, she has suffered a lot, if she can overcome so much, so can I" (Interviewee 6).

Correlations between "How far in school a student thinks they will get" and "Student in class often feels put down by teacher" are statistically significant (b = -.083, $p \leq .05$). The more Latina students agree that they feel put down by their teachers, the less likely they want to obtain a higher education (see Table 1.11), which may be due to stereotypes and discrimination. Latina students who feel unwelcomed

		Ever in a bilingual/bicultural class		
Whether English is student's native language		*No*	*Yes*	***Total***
	No	37.8%	15.2%	53%
	Yes	30.9%	16.1%	47%
	Total	68.7%	31.3%	100%
Total		1049		

Table 1.9 Crosstabulation of "Whether English is student's native language" and "Ever in a bilingual/bicultural class" (ELS 2002)

		How far in school a student thinks they will get	**Teachers expect success for the student in school**
How far in school a student thinks they will get	*Pearson correlation*	1	
	Sig.		
	N	983	
Teachers expect success for the student in school	*Pearson correlation*	.145**	1
	Sig.	.000	
	N	925	1060

**$p \leq .01$

Table 1.10 Correlations between "How far in school a student thinks they will get" and "Teachers expect success for the student in school"

[4] Unfortunately, these data do not allow for researchers to determine this in order to protect the anonymity of the respondents. However it is very possible that a lack of support for Latino students in these schools is present.

in the classroom and whose experiences in high school are not positive may not want to continue their education in college. Although this relationship is statistically significant, this relationship is also weak; various reasons may exist for this relationship. On one hand, it may be that, even if Latinas feel put down by their teachers, they are using this as an incentive to obtain a higher education; but it is also possible that Latinas who feel put down by their teachers are reaching out for other individuals for educational support.

Surprisingly enough, not all correlations were statistically significant within the education component of this project. Puzzling results demonstrate correlations between "How far in school a student thinks they will get" and "Whether the student thinks that their teachers praise student effort" (see Table 1.12). Teachers' praise for Latinas' effort may not significantly influence their decision to go to college. Latinas' past educational experiences may affect their experiences in school today; here, the lack of support for Latinas' education in the past may affect Latinas' perception of their teachers' opinions. There could be various reasons why this relationship is not statistically significant; for example, Latinas' reliance on teachers for this decision may not be as important as that of other people in their lives, such as their family members or friends.

Another correlation between the variables of "How far in school a student thinks they will get" and "Punishment by the teachers and administrators is the same no matter who you are" is also not statistically significant (see Table 1.13). Most of the students participating believed that punishments in their school are the same, regardless of the involved student's identity. However, even though this relationship is statistically significant, it is weak, which might be due to the students' beliefs in receiving equal treatment from their schools' authority figures. Latina students may believe that everyone is punished equally, and this may not affect their college decisions.

Additionally, when correlations between "How far in school a student thinks they will get" and "Ever in a program to help prepare for college" were conducted, the

		How far in school a student thinks they will get	**In class often feels put down by teachers**
How far in school a student thinks they will get	*Pearson correlation*	1	
	Sig.		
	N	983	
In class often feels put down by teachers	*Pearson correlation*	-.083*	1
	Sig.	.012	
	N	921	1058

**p ≤ .01

Table 1.11 Correlations between "How far in school a student thinks they will get" and "Student in class often feels put down by teacher"

		How far in school a student thinks they will get	**Teachers praise student effort**
How far in school a student thinks they will get	*Pearson correlation*	1	
	Sig.		
	N	983	
Teachers praise student effort	*Pearson correlation*	.041	1
	Sig.	.220	
	N	915	1049

Table 1.12 Correlations between "How far in school a student thinks they will get" and "Teachers praise effort"

		How far in school a student thinks they will get	**Punishment is the same no matter who you are**
How far in school a student thinks they will get	*Pearson correlation*	1	
	Sig.		
	N	983	
Punishment the same no matter who you are	*Pearson correlation*	.031	1
	Sig.	.344	
	N	983	1056

Table 1.13 Correlations between "How far in school a student thinks they will get" and "Punishment is the same not matter who you are"

expected pattern is shown to be present, but the relationship is not statistically significant (b =.051). As the student's desire to obtain a higher education increases, her participation in programs that help her to prepare for college also increases (see Table 1.14). There may be various reasons for this relationship; we have to remember that this variable refers to the student's perspective. Although students participated in such programs, they might not have acknowledged them, or they were unaware that it was a program specifically geared towards college preparation. It is also a possibility that Latinas attend schools where these types of programs are unavailable. Teachers creating other opportunities for students to learn about college may supplement schools that may not have such resources. During the qualitative interviews conducted for this project, three out of eight participants said that their school had a program that taught them about college; the other women mentioned that their schools did not have a special program that taught them about college. They mentioned that every teacher talked about college but there was never a special program that related to college. "Every class teachers would talk about college, sometimes they had college students come give presentations" (Interviewee 2).

		How far in school a student thinks they will get	Ever in a program to help prepare for college
How far in school a student thinks they will get	*Pearson correlation*	1	
	Sig.		
	N	983	
Ever in a program to help prepare for college	*Pearson correlation*	.051	1
	Sig.	.119	
	N	927	1059

Table 1.14 Correlations between "How far in school a student thinks they will get" and "Ever in a program to help prepare for college"

The interviews were able to provide more detailed information on how the school as an institution affects the decision-making process of young Latinas. Most women who participated in the qualitative interviews confirmed the teachers' support for a higher education (seven out of eight); they mentioned how their teachers really helped them to make a decision of applying to college. "One of the teachers asked everyday if I had applied" (Interviewee 3). Experiences of Latinas in schools and their relationships with their teachers may differ according to how diverse their schools were.

A very important factor that I believe may have a large effect on this decision-making process is the students' experience in school as minorities. Most of the women who were interviewed attended very ethnically and racially diverse schools (six out of eight). All four women agreed that their schools had a large Latino population. When asked about their school experience as minorities, seven out of eight women had positive reactions. "Awesome, I was homecoming queen, once in a while there was drama but always about girls and boys" (Interviewee 1). "My experience was fun, everyone got along with everyone" (Interviewee 2). This may be different if asked to a Latina who has attended a not very diverse school. Two of the women who participated in the study attended a school that was not ethnically or racially diverse. Their experiences were very different: one of the participants felt marginalized and discriminated against, while the other participant felt confident and optimistic. "It helped me because I had an easier chance at being remembered by teachers" (Interviewee 8). "There were not a lot of Latinos, people look at you differently and notice more how you act and dress" (Interviewee 7).

The school institution also carries actors who may be viewed as role models by students. Actors include teachers and other staff. When participants were asked who their main role models were, only one student chose school staff as her role model. Six of the participants said that their role models were their parents and family members, and one said she did not have any. "I don't know, don't really have one (role model), I strive to do better" (Interviewee 4).

Interviewees were also asked what some barriers as well as avenues of opportunities were that Latinas might encounter when obtaining a higher education. For barriers, responses varied from financial availability, discrimination, stereotypes, pregnancy, correct information, bad influences, and traditional family beliefs. The value of familism and shift from traditional to non-traditional roles were reflected during the qualitative interviews. "Really traditional families where education is not a priority, where family came first. Kids mix up with bad kids, gangs and unnecessary stuff. Idea that they'll be fine without school is not right" (Interviewee 3). Additionally, importance of role models was also acknowledged during the qualitative interviews. "Financially, that's what happened to a lot of my friends.... Also not a lot of push, for many, not a lot of people in their family have gone to college. The feeling of I can't do it. Some of my cousins don't feel like college is for them because there is no one there to push them they all feel like it's too expensive, also they are not informed enough about scholarships and financial aid" (Interviewee 1). Information and quality of education are very important for Latinas to continue their academic goals after high school. "The type of school, I am lucky I went to a good school, a lot of Latinos don't have that opportunity to attend to a school with a quality education" (Interviewee 8). As stated in the quotes, Latinas acknowledge that not all Latinas are able to obtain a higher education, and there may be institutional reasons for this.

Avenues of opportunities that were discussed included correct information about college and resources to gain knowledge of what it is like to be in college and how to apply. Participants also mentioned that scholarships geared towards Latinas would be of great help. "Scholarships directed to Latinas would open more opportunities" (Interviewee 2). Additionally, Latinas in-

terviewed agreed that there are differences that are present in schools within students and that teachers may perceive them. But they are optimistic that Latinas should not focus on the negatives if they want to pursue their dreams. "To not focus on the differences but on the similarities and know that even if you are different you will succeed if you put your mind into it" (Interviewee 8). As shown with the quantitative data, most Latinas in schools in the United States do not speak English as their native language. Latinas interviewed believe that there is a need for schools to acknowledge that not all students speak English, but they should not be held back because of this. "I think it would help if there was a larger understanding on the different languages or more classes that help you learn English as you go along" (Interviewee 7). Opportunities presented by Latinas who were interviewed may also be a reflection of the lack of opportunities available at the schools they attended. Some of these opportunities may be present at other schools, but it is a large possibility that they are not all present homogeneously at all schools. Additionally, a very important avenue of opportunity mentioned by all participants is less discrimination in the schools. Although most Latinas who participated in the interviews attended very diverse schools, they acknowledge that discrimination is present in the school institution. Even though most women interviewed described their schools as very positive settings and they enjoyed their experiences in their schools, they continued to claim that discrimination is present. Latinas who were interviewed mentioned they feel that it is harder for them to obtain a higher education than it is for their non-Latino classmates.

Finally, Latinas who participated in the interviews were asked if they believed the pay-off of going to college is more, equal, or less than what they are putting into college. One of the participants said that, financially, sometimes the pay-off is not equal. "All you need is training and good communication skills … at my job all people in higher positions have no degrees … my district manager at my job has no degree … makes a ton of money … my mom's boss, same thing, he owns a big corporation and has no degree, just good training … a lot of time people don't even get jobs in their degrees" (Interviewee 1). Financially, some Latinas indicated that college costs are too expensive for the types of jobs a person may obtain once graduated. The rest of the participants said that the pay-off is greater than what they had ever expected: that they learned to grow and also learned a lot more about themselves. "More than expected, the amount of knowledge I learn about myself. No one that can stop me but me. I am lucky to have a supportive family, a lot of friends whose parents would rather have them do something else" (Interviewee 3). Some of the women interviewed view the pay-off of college as a self-determining journey. Financially, they do not see it as a pay-off. Family support for higher education was a very important factor and topic of discussion throughout the interviews. Most Latinas who were interviewed for this project feel a large family support for college enrollment. Latinas interviewed have demonstrated pride in obtaining a college education.

DISCUSSION

Family

Utilizing both quantitative and qualitative methodologies has given us a better idea of how Latinas decide whether or not to continue their education. The qualitative interviews were very helpful in gaining detail information about Latinas' experiences in their homes and schools. Although the qualitative interviews are nonrepresentative, they have served as a means to gain a broader perspective on what Latinas' experiences are like within their families.

Family values and traditions were explored through descriptive statistics within the following variables: "Individuals that Latina students have gone to for college information in tenth grade." Additionally, crosstabulations between variables of "Students' belief that teachers praise effort" and "Importance of getting a good education," "How far in school a parent wants their child to go" and "How far in school a student thinks they will go," and "Parent's highest level of education," and "How often the child discussed going to college with their parents" were also conducted to gain a better picture of how the family is influencing Latinas' decision to go to college.

Furthermore, several correlations were conducted to understand better how family values and traditions affect the decision-making process of college enrollment for many young Latinas. The following correlations were statistically significant and positive, but they were weak: "How far in school a student thinks they will pursue" and "How well their parents understand spoken English"; and, "How far in school a student thinks they will pursue" and "Parent satisfaction with their tenth grader's education." The results for the correlation of how far in school a student thinks she will get and living at home while attending post secondary school were significant in the expected direction, but the strength of the relationship was weak. The results from this data analysis can be seen directly as relevant to the theoretical frameworks that were used for the understanding of this issue: Symbolic Interactionist Theory, Cultural and Social Capital, and Critical Race Theory. Additionally, family values and factors affecting this decision-making process, such as familism and role models for Latinas that were depicted by past scholars, were vibrant in the data analysis and interviews.

Symbolic Interactionist Theory

Results possibly suggest that Latinas derive the meaning of what it is to value education from the symbols they see at home and their relationships with their parents and other family members. As Latinas grow up, they start associating different meanings to symbols; the meaning of education may be associated with success and better life chances. The Latino family emphasizes education to offer better opportunities to their children. Latinas with parents who do not have a higher education may use their parents' experiences as incentives to obtain a higher education. Additionally, even if some of the parents may not have a higher education, they continue to emphasize the importance and value of higher education to their daughters. As they grow up and they see their parents struggle, they may also begin to associate higher education with other doors of opportunities. Many of the women interviewed for this study mentioned that the reason why they want to obtain a higher education is so that they will have better opportunities and fewer struggles

than what their parents had. Similarly, as demonstrated in the secondary data set of the Education Longitudinal Study, 73% of Latinas' close family members want them to obtain a higher education. This shows that Latino families know that education is an avenue of opportunity to a better future. The importance of obtaining a higher education can be understood through different symbols, which then gain a certain meaning as Latina students grow up. With the crosstabulation of "How far in school a student wants to go" and "How far in school parents want their children to go," the majority of the participants want their children to graduate from college. This also demonstrates how parents teach their children the symbols and meanings of obtaining a higher education by placing a high value and importance in college education.

Additionally, as Latinas learn certain symbols, and later on their meaning and value, they are able to associate these meanings with certain roles they play. Contrary to past literature, the role of Marianismo was found not to play an active role in the interviews conducted for this study or the correlation between "How far in school a student thinks she will get" and "Living at home while attending post secondary school." This relationship was negative and statistically significant. As more parents become more understanding of their daughters obtaining a higher education and living outside of home, the goal of obtaining a higher education for Latinas increases. Latinas continue to associate different meanings to diverse roles of the family as they grow up; as the results show, they are no longer basing their role to stay in the home and set their own ambitions last. It may be that in the United State today, Latinas are encouraged to become more independent. In a way, they are defining a new role within the Latino family: the role of the student, emphasizing their studies and academic performance first. Contrary to the literature reviewed for this project, most women interviewed did not have a lot of family obligations[5]. Although they did help out in the home when they were needed, their main role was to focus on their education. Latina women are perhaps becoming more independent, and their families are also becoming more understanding of their need for independence as an avenue of opportunity to obtain a higher education.

Furthermore, Latinas associate the different roles, symbols, and meanings with different people whom they may look up to and view as role models. This may include their parents, siblings, and family members. Most Latinas in the qualitative interviews view their family members as their role models, more so than they view individuals found in the education institution. When asked who their role models were, most Latinas interviewed answered that it was one of their family members because they have seen them struggle and work hard to be where they are today. Latinas may learn the meaning of struggle and hard work as they grow up, and they are able to associate it with their parents and other family members.

Moreover, the value of familism is also learned in the family through different symbols and meanings attached to those symbols. Latinas are able to learn the meaning of familism by having family unity and closeness, which is demonstrated by one of the participants as "unconditional love" (Interviewee 1), or to be there for each other no matter what. As found in the interviews and secondary data set, the value of familism appears to be very important for Latinas. Family unity and closeness were emphasized throughout the interviews and demonstrated by the quantitative analysis of family and parental support for Latinas obtaining a higher education. Most Latinas described helping their family whenever they were needed, especially through translating for their parents.

Symbolic Interactionist Theory also identifies how traditions are associated with symbols and meanings through the family as children grow up. Most of the traditions described by Latinas who were interviewed depicted holidays, music, and food. Symbols of certain music and certain flavors are interpreted as traditions by Latinas. Visiting family members several times a year was also described as a very important tradition by several Latinas. But traditions did not seem to have a large impact on defining their educational future. However, Latinas may be able to gain different Cultural and Social Capital about college from the visiting of family members, which may influence their decision whether or not to continue their education after high school. While this remains a viable possibility, it was not explored in the interviews and thus may be a topic future scholars should investigate further.

Cultural and Social Capital

Cultural capital can be gained through different institutions, the family being the primary one. Latinas are able to gain some cultural capital from their parents, siblings, and other family members. With the results found for this project it seems clear that there is a lack of communication between the parents and the schools. This means that parents without access to cultural capital that benefits the college decision are in a situation where necessary information for college is not being received. The correlations of "How far in school a student thinks they will get" and "How well their parents understand spoken English" demonstrate that a language barrier may affect the student's decision to obtain a higher education. If parents are unable to communicate with the schools, they may not be able to share important information about college with their children if the parents themselves do not have that information. Additionally, all Latinas interviewed are first-generation students going to college, so young women could not gain from parents' capital on college here: for example, how to find financial aid, how to fill out applications, what schools to apply to, what classes are like, and what it is like to live in a dorm; this is information that parents may not have because they did not go to college themselves. Despite this, parents in both the quantitative and qualitative data are very supportive of their daughters' obtaining a higher education. Although Latinas' parents may not have the correct capital for Latinas about college, Latinas continue to reach out to their parents and family members to discuss the topic of college. This is explored in the crosstabulation between "How often student discussed

[5] Latinas' obligations were unfortunately not a topic that could be explored with the secondary data set. Since the qualitative interviews are not representative, these results should be cautiously interpreted. I encourage other scholars to investigate whether this shift in roles and obligations is occurring for all young Latina women.

going to college with their parents" and "Parents' highest level of education." The majority of Latina students nationwide are discussing college enrollment with their parents, no matter what level of education their parents obtained.

The correlations between "How far in school a student thinks they will get" and "Parents' highest level of education" also show the importance of the transmission of cultural capital from parents to children in the process of Latinas' obtaining a higher education. This statistically significant relationship depicts how students with parents who have gone to college have a better chance to obtain a higher education. This may be due to the passing of cultural capital; Latinas whose parents have a college education are able to obtain the correct knowledge and information about a higher education, which is essential when deciding whether or not to go to college. As education itself is a form of capital, parents with a higher level of education have a larger access to important capital. Additionally, Latinas whose parents have a college degree are more likely to have more money and a higher socioeconomic status, both of which are forms of capital, thus making it easier for those Latinas to obtain a higher education without that financial burden or at least with fewer financial worries. In essence, Latinas whose parents attended college have an abundance of capital they can draw on as they make their decision about higher education[6].

Furthermore, social capital can also be gained through the family. One of the main traditions that women revealed during the qualitative interviews was visiting family members throughout the years. Most of the visits occur in different states or the family's country of origin. In the national data, most family members (over 70%) want Latinas to obtain a higher education. By visiting family members, Latinas are able to network and gain different relationships that may be able to help them gain chances later on in life. Both quantitative and qualitative data reveal that family members are supportive of higher education. These family members may be able to supplement support with capital that benefits young Latina women.

Critical Race Theory

Different practices and regulations by the school institution may also affect young Latinas' college enrollment decision-making process. Communication between the parents and the schools is very important and may possibly affect Latinas' educational experience. The correlation between "How far in school a student thinks they will get" and "How well their parents understand spoken English" is an example of how the translation of various documents and translators between the school administrators and the parents may have a large impact. When parents have a lower level of understanding for the English language, it is more difficult for them to participate in school functions and meet with teachers about their children's class participation. If schools are able to increase communication between Latino parents and teachers and/or school administration, it may benefit Latina students as an avenue of opportunity to increase their chances for obtaining a higher education. Correct information about college would be able to be shared with parents who do not have access to that information, which could then be passed on to their children.

Barriers and Avenues of Opportunity

Latinas who were interviewed described that one barrier that may be holding other young Latinas back from obtaining a higher education could be very traditional families. Some of the interviewees for this qualitative portion of this project agree that very traditional gender roles may impact Latinas' decisions on going to college. One of the participants mentioned that she had friends whose parents are very traditional and would rather have their daughters working at home working than in college. Although traditional roles do not appear to be as common, it appears that, when they are present, they may continue to affect Latinas' college enrollment decision-making process. Parental support for higher education may be very important and affect traditional roles. It is possible that, with parental support for higher education, traditional roles such as marianismo may shift to nontraditional roles. With more parental support for their daughters to go to college, parental expectations of their daughters may also change. Marriage was another barrier identified by Latinas who were interviewed. One of the women interviewed was not in college because, although she was not married, she lived with her boyfriend. She discussed how her choice of living with her boyfriend affected her decision not to go to college because, if she had not moved with him, she would have continued her education. Cohabitation, marriage, and dating may also affect Latinas' decision on going to college. Similar to this participant, other women participating in this project mentioned how they had friends or relatives who did not continue their education after high school because of marriage. It is a possibility that Latinas who decide to obtain a college education are also deciding to wait on marriage[7]. In some cases, this may contrast with their family values within traditional roles.

Although Latinas may face many barriers in obtaining a higher education, avenues of opportunities were also discussed with the participants for this project. Women who were interviewed agreed that family and parental support for higher education affected their decision on college enrollment. Most of the participants who were going to college were the first ones in their families to go to college. They all felt great pride on obtaining a higher education and proving stereotypes wrong. These women have learned to use their parents' past experiences as an incentive to want more than what their parents have and find better life chances through higher education.

Education

Quantitative and qualitative methodologies were both used to obtain a better depiction of how Latinas decide whether or not to attend college. Descriptive statistics with the following variables helped obtain a better sense of the school institution and Latinas' experiences: "Latina students believe teaching is good at their school" and

[6] This argument may be relevant to all children whose parents have this access to Cultural Capital and other types of Capital. Further research should investigate how relevant this is to the Latina student population specifically, as well as other student populations.

[7] Delaying marriage to obtain a higher education is a national pattern (Casper and Bianchi 2002). Future scholars should explore the role of traditional roles in the process to determine if this is an experience unique to all women or if it is specific to Latina women.

"Latina students believe that teachers are interested in students."

Several crosstabulations and correlations were analyzed to understand better the Latina experience in school and how this may affect her decision-making process about higher education. Crosstabulations were conducted to demonstrate a picture of Latinas and higher education. A crosstabulation was conducted between the variables of "Student believes that teachers praise students' effort" and "The importance of getting a good education" for that student. Overall, most Latinas value education as very important. Although not all Latinas believe that their work in school is valued, they continue to focus on education as an important value. This may demonstrate how the importance of education is not learned through the school but through other socializing institutions, such as the family. A crosstabulation was also conducted between the variables of "Whether English is the student's native language" and "If the student has ever been in a bilingual/bicultural class." Whether schools offer programming for students who do not speak English as their native language may affect Latinas' experiences in education. Crosstabulations will be discussed in the following section.

Correlations for variables to explore Latinas' educational experiences may raise questions of what Latinas are really experiencing in the school institution. Correlations between the variables of "How far in education a student wants to go" and "Students' favorite teacher desire for the respondent after high school" were conducted. Results are statistically significant, but the relationship is weak. The rest of the correlations were not statistically significant: "How far in school a student thinks they will get" and "Whether the student thinks that their teachers praise student effort"; "How far in school a student thinks they will get" and "Student's belief that punishment is the same no matter who you are"; and, "How far in school a student thinks they will get" and "If student has ever been in a program to help them prepare for college." These puzzling results may lead to scholars reviewing these types of variables and conducting further research on the relationship between teachers and Latina students. Results will be explored in the next section. Additionally, to be able to understand the results of this data analysis and interviews, theoretical frameworks such as Symbolic Interactionist Theory, Cultural and Social Capital, and Critical Race Theory were used in this project.

Symbolic Interactionist

Theory. Teacher influence may or may not be important when Latina students decide whether to obtain a higher education. In order to understand the previous puzzling results, scholars can think about the various possibilities for teacher influence on Latinas' decisions to go to college. Latinas are able to associate meanings and symbols with the resources that their teachers share with them. When teachers are able to emphasize the importance and value of obtaining a college degree, Latinas may begin to associate the meaning of obtaining a higher education with the symbol of college and a college degree. The correlation between "How far in school a student wants to go" and "The students' favorite teacher desire for the respondent after high school" demonstrates how the respondent's favorite teacher impacts her decision to go to college. The results from this correlation demonstrate that the relationship between these two variables is weak, but the direction of the relationship is positive and significant. It is possible that the students' favorite teachers are emphasizing college to their students and that this is how some students learn the meaning of obtaining a higher education. Teacher influence may be important for students to obtain a higher education. On the other hand, it may be that Latina students are not influenced by their teachers regarding college: although Latinas value their teachers, their teachers' opinions may not matter as much as those from other sources, such as the family.

Even though teachers' influence may be important to some students, only one of the Latina student participants in the qualitative interviews said she viewed her teachers or school staff as role models. Combining this information with the quantitative data, it is a possibility that because only 13% of the English teachers are Latinos and only 18.2% of math teachers are Latino in the United States (ELS 2002), Latina students may not be able to identify with their teachers or school administrators and therefore may not view them as role models. Role models are important because they may serve as symbols of what the student wants to be like in the future. Role models may also be a way for students to have an individual as a guide or someone they may be able to rely on for help. Role models are able to share with Latinas different symbols, which Latinas are able to attach meaning to later on. For example, most Latinas who were interviewed for this study viewed their parents as their role models because they had seen them struggle and persevere. Latinas learn to associate their parents with how they are able to overcome struggles; later on, Latinas view them as role models. Latinas may not have role models in the school institutions, and it is possible that this is creating a barrier to higher education. It is also possible that Latinas' role models may not have such a great influence on the decision to obtain a higher education since nationally, most Latinas want to obtain a higher education. We must also remember that Latinas do not have to find role models with the same racial or ethnic background as themselves. Latinas' role models may be individuals from different socioeconomic backgrounds or races/ethnicities. These individuals may impact Latinas' college decisions. Future research should explore who Latinas' role models are, how they identify with these individuals, and how this may or may not affect their college decision-making process.

Cultural and Social Capital

Latina students are also able to gain cultural and social capital through those involved in the school institution. A factor that impacts young Latinas' decision-making processes is correct information and knowledge about college, in other words, cultural capital about college. However, it turns out that most students are not going to their teachers for college information; rather, they are going to their parents, siblings, and family members. This is vital for students because, if some students are not able to gain the needed information from their parents, they are not turning to the schools for this information. Therefore, communication between the parents and schools becomes very important in order to ensure that Latinas have the right in-

formation about college. According to the national data, less than half of Latina students go to their school counselors for college information, and only 5.4% go to their school coaches. Latina students would be able to gain cultural capital about college if they were able to go to their teachers for this information. It is a possibility that because some students do not feel comfortable with their teachers, they do not go to them for such information. Unfortunately, understanding why these women did or did not go to particular individuals for advice was not explored in this secondary data set. Future researchers should investigate this more fully to understand young Latinas' college decision-making processes better.

The correlation between the variables of "How far in school a student thinks they will get" and "Whether the student believes that their teachers praise student effort" is not statistically significant, although the relationship operates in the expected direction. This may demonstrate how, even if the students believe that the teachers are praising their efforts at school, they are not gaining as much from school institution agents that helps them make the decision on whether or not to go to college. Also, the correlation between the variables of "How far in school a student thinks they will get" and "Whether a student was ever in a program to help prepare them for college" was not statistically significant. It is a possibility that students do not have the opportunity to participate in such programs. It may be that Latinas are reaching out to other sources and institutions, such as the family, for necessary college information, which is why this may become a barrier if the parents or family members do not have the correct information.

To understand further how the school as an institution is aiming to help Latinas continue their education, the crosstabulation between the variables of "Whether English is the student's native language" and "If the student has ever been in a bilingual/bicultural class" shows that most Latinas were not involved in bicultural or bilingual classes, even though they did not speak English as their native language. It is possible that schools do not offer such classes; it is also possible that Latinas are not aware of them or participating even though their schools offer these classes. Most Latinas do not speak English as their native language. In many cases, this may be a reason of Latinas' progress in school. English language programs may help Latinas finish high school, obtain a higher education, and gain cultural and social capital from classmates and school agents.

Additionally, society values types of cultural capital differently; the cultural capital that that Latinas possess may not be valued as highly as that of other students. Latina interviewees who attended more diverse schools felt more comfortable than students who went to less diverse schools, and they were most likely to participate in school extracurricular activities. Since extracurricular activities are a way to obtain college-related cultural and social capital, they may increase Latinas' opportunities for gaining information and connections that can help them make decisions about college. Access to such activities and different types of school courses may depend on policies and regulations according to demographic areas.

Critical Race Theory

Policies and regulations can affect whether schools have college preparatory classes or bilingual/bicultural classes. Resources provide opportunities for Latinas to become involved in their schools and continue their education. Bilingual and bicultural classes may affect Latinas' college decisions because they can help Latinas perform better in school, thus opening the doors to higher education if English is not their native language. Additionally, they may be able to feel more comfortable in an environment where more than one culture is acknowledged. Bilingual and bicultural classes may also benefit Latinas' parent-teacher communication, which may help Latinas obtain all sources of information they may need to apply to college.

Latina interviewees who attended more ethnically and racially diverse schools described a better relationship with their teachers than interviewees who attended less-diverse schools. The correlations between "How far in school a student thinks they will get" and "Whether the student thinks that their teachers praise student effort" were not statistically significant, although they patterned in the expected direction. Although most Latinas believed their teachers were good teachers, their teachers' praise for student effort has not demonstrated any impact on their desire to attend college. It is possible that the lack of teacher involvement and school support in the past has lessened Latinas' reliance on teachers as their main support system today. While most students believe that their teachers praise their efforts and Latina students felt very positive about their teachers, perhaps Latinas simply do not let teacher opinions influence their decisions for their future. Since students might not compete for their teachers' praise, it might not be valued so highly.

Additionally, teachers may reflect school regulations because they are agents of the school institution. The correlation between "How far in school a student thinks they will get" and "Punishment is the same no matter who you are" is not statistically significant. Most students believed that the punishment was the same no matter who the student was, and this does not affect Latinas' college decisions. Because policies and regulations might not be equal throughout the schools, Latina students do not let them affect their decision to continue their education. Rather, Latinas might be using these policies as an incentive to go on to college. Another possibility is that teachers might carry out punishments independently of school policy and students know it: for example, some teachers might employ stereotypes in the classroom, limiting the level of discrimination at a school to just those classrooms where stereotyping exists.

At first glance, the combination of significant and non-significant results from the national data might seem to contradict the relationship between Latina students and teachers. However, what is more likely is that the relationship between teachers and Latina students is very complex and extends outside the classroom. Some interviewees mentioned that their teachers took them and other students on road trips to visit colleges, while other interviewees did not remember most of their teachers' names. Meanwhile, interviewees who felt marginalized by their teachers used them as an incentive to prove them wrong by continuing with their education. The Latina student-teacher relationship varies ac-

cording to the students' attitudes towards their teachers, and vice versa. The impact teachers make on their Latina students is an area of study yet to be explored adequately, but doing so could elucidate the role of teachers in the Latina college decision-making process.

Barriers and Avenues of Opportunity

Several barriers exist that have hindered Latinas' pursuits for higher education, and these have been discussed in the literature (Hernandez 1995; Crosone 2005; LeCroy and Krysik 2008; Olive 2008). When interviewees were asked, "What are some barriers for Latinas to obtain a higher education?", their answers included financial difficulties, pregnancy, stereotypes, discrimination, bad influences, men and marriage, and traditional families, but almost all of the interviewees agreed that economic reasons are a main reason. Although some financial policies and regulations exist to increase the number of Latina college students, many of the interviewees were unaware of them because they were not informed. All of the interviewees agreed that one of the main barriers for Latinas is discrimination. One interviewee shared that discrimination is everywhere, but it is more noticeable when a person is a double minority—both female and Latina (Interviewee 3). Discrimination in schools may impede Latina students from trying their best, which might discourage them from continuing their education in a harsh environment. Very traditional families are also viewed as a barrier to higher education. Two of the interviewees mentioned how some parents prefer to have their daughters at home or working with them instead of letting them go to college. Rather than demonstrating a lack of parental support, this might indicate insufficient communication between schools and parents regarding what college can provide. Finally, one participant mentioned how men and marriage are a big problem because Latinas often fall in love or get attached to a man and are unable to continue their education because they have to help support their family (Inteviewee 5). This may be related to the possible shift from traditional to nontraditional roles, but nonetheless, traditional roles continue to exist despite the increasing number of Latinas in college.

Other barriers identified by the Education Longitudinal Study data and results include the lack of communication between parents and school staff. Communication is key for Latinas to obtain information about college. In many cases, parents do not have this information because they did not complete college. If teachers and school administrators cannot communicate with the parents, and students are not reaching out to schools, information about college may not be transmitted. As we have learned, the Latina student-teacher relationship is very complex. Although the degree of teacher influence on Latina college decisions varies, if Latina students start to view their relationships with their teachers as significant, and if schools begin to communicate more effectively (bilingually or not; so long as it meets the parents' needs), barriers can be transformed into opportunities.

All of the interviewees agreed that information is the best way to help Latinas make college decisions, particularly knowledgeable and accurate information about college, financial aid, the application process, and college life. Schools should be able to provide sufficient bilingual resources for students and their parents. Additionally, for Latinas to use their teachers as resources and connect with them, they have to be able to feel more comfortable in the classroom environment. Scholarships were another opportunity discussed in all the interviews. Because college is so expensive, scholarships geared towards Latinas may help them to continue their education. Interviewees viewed the elimination of discrimination as the most important opportunity; although most participants attended more diverse schools, they all had experienced instances of discrimination growing up as Latinas in the United States.

Correlations and crosstabulations from this study demonstrate that more communication and teacher interaction with students may open opportunities for Latina students to obtain a higher education. Additionally, teachers' expectations for their students may also encourage Latinas; connecting with teachers and viewing them as role models may facilitate Latinas' access to the correct information about college.

Various reasons might exist for the weak or not significant correlations between the variables calculated for this project. Other variables that were not accounted for could be mediating these relationships. Another possibility is that these variables are simply not the best ones to describe the Latina experience in the educational institution. Although the relationships were weak, relationships between variables were in the expected directions. However, future research should try to capture the school and family experiences as closely as possible so we can best understand what relationships exist.

The mixed results of this project lead me to believe that the Latina experience in education may be similar to that of other students with the same socioeconomic status. Students with lower socioeconomic status might lack access to cultural and social capital that aids the college decision-making process. At the same time, there are some specific experiences that not all students from lower socioeconomic statuses encounter. The secondary data set results from the Education Longitudinal Study may help us understand the similarities of Latinas with students from other ethnicities who share the same socioeconomic status: for example, Latinas' perception of their teachers, their schools' college preparatory or bilingual/bicultural course offerings, their attendance in such courses, and even their communication with their parents about college. However, due to the qualitative section of this study, I have discovered that some of the Latina students' experiences are very different from that of other students: the shift from traditional to nontraditional roles for Latinas; the personal reasons for pursuing higher education (identified by Latinas as wanting to have better life chances than their parents); and, Latinas' utilizing their parents' experiences and stereotypes as incentives to continue their education. Additionally, the acculturation, enculturation, and assimilation processes, as well as different policies and regulations aimed at impeding Latinos from obtaining an education, may be experiences specific to Latina students. Latinas' experiences in the school institution and their family values and traditions may share similarities with those of students with equivalent socioeconomic status, but at the same time they may also be different.

CONCLUSION

Theories such as Symbolic Interactionist Theory, Cultural and Social Capital, and Critical Race Theory were used to clarify the Latina's educational experience and her family values and traditions at home. Quantitative and qualitative methodologies were utilized to decipher secondary data and one-on-one interviews. Research questions of: *How do family values and traditions affect eighteen to nineteen year old Latinas decision-making process of going or not going to college?* and, *How does the school as an institution affect the decision-making process of college enrollment for young Latinas?* were analyzed in this research.

Contrary to stereotypes, Latinos do value education. After this project, I was able to support the argument that Latinos highly value education through the use of both qualitative and quantitative data. Although there is a low high school completion record within the Latino community at large, the number of Latinas going to college is slowly increasing. Today's generation of Latinas are finding more family and parental support to obtain a higher education. Even though most of these women are first-generation college students, and they are unable to gain as much cultural and social capital about college or the correct information about college, their parents and family members know the importance of a college education and want this for their daughters. Latinas use their parents' and family experiences as an incentive to be able to have a better future and not struggle the way they did.

The relationship between Latina students and the school is very important for Latinas so they may gain information about their options for their future. There appears to be a lack of communication between Latinas' parents and the schools. Such communication is very important for Latinas and their futures. On the one hand, it is important for parents to understand what the role is of the school as an institution; on the other hand, it is important for agents of the school institution to understand how Latino families view education. Schools must be responsive to the needs of the parents as they attempt to help their children to obtain a college education. Guiding Latina students towards college, better life chances, and new opportunities must become the goal of both the parents and the schools.

Furthermore, within the school institution, most Latinas do not appear to view their teachers or school staff as role models. Because there are not a lot of Latino teachers, perhaps Latina students do not feel comfortable to connect with them and view them as role models. Although the Latinas interviewed and those participating in the secondary data agree that they have good teachers, they do not view them as role models and they do not seem to constitute an important support system. If, over time, Latinas have not felt supported by the school institution to pursue a higher education, they might look for that support from other sources, such as the family. Teachers and schools should make supporting and inclusive learning environments a priority. In this type of environment, students should be encouraged if they want to pursue a higher education. Regardless if some students do not want to pursue college after high school, schools should provide supportive and inclusive environments to all students.

Future Research

There were several shortcomings with this study. First, data that specifically addressed Latinas' family values and traditions in relation to their educational aspirations would have provided more definitive conclusions and indicated whether these are values and traditions specific to Latino families. Second, many women who wanted to participate were unable to do so because of fears related to immigration (either theirs or their parents'). Researchers should be cognizant of this and seek to create safe environments for interviewees while attempting to obtain research information. Additionally, scholars should continue to analyze the variables used in this study or similar variables, as doing so would increase our understanding of the Latina educational experience and college decision-making process. Deeper analysis may uncover if relationships between Latinas and their teachers are stronger, or if their family values have a greater influence on the Latina college decision-making process. A larger sample for qualitative interviews may reveal details about the experiences of second-generation Latina students. Additionally, a more diverse sample for the qualitative section may give researchers a better basis for comparing and contrasting the Latina's experience to that of other students as well as other participants. Participants from different socioeconomic statuses, races, and ethnicities may help compare and contrast Latinas' educational experiences and their family values and traditions at home. Ethnic and racial diversity in schools may also affect the experiences of Latina students and their college decisions. This may also depend on the schools' demographic tendencies and financial resources, which should be explored further. Finally, the dimension of friends and peers was not investigated in this study and further research on this area may be important for understanding the Latina decision-making process. It is also important for future research on Latinas in higher education to understand how our society is growing and what may be some ways to help fight policies and regulations that are holding this population back from bettering their futures. I want to encourage future researchers to continue scholarly work on Latinas and higher education and influences on their decision-making process. Scholars should consider focusing on policies and regulations across the United States that may affect Latinas' education and if these are impeding their pursuit of higher education. In the future, researchers should also identify the incentives that young Latinas have encountered to obtain a higher education.

The purpose of this research was to understand the Latina educational experience and family values and traditions at home. Latinas' roles in the family may be changing, and their claim for independence may be augmented through higher education. The family and school institution play a large role in shaping Latinas' life chances. Because the Latino population is growing rapidly, it is important to learn about this population, their goals and ambitions, and how they are affected by policies and regulations.

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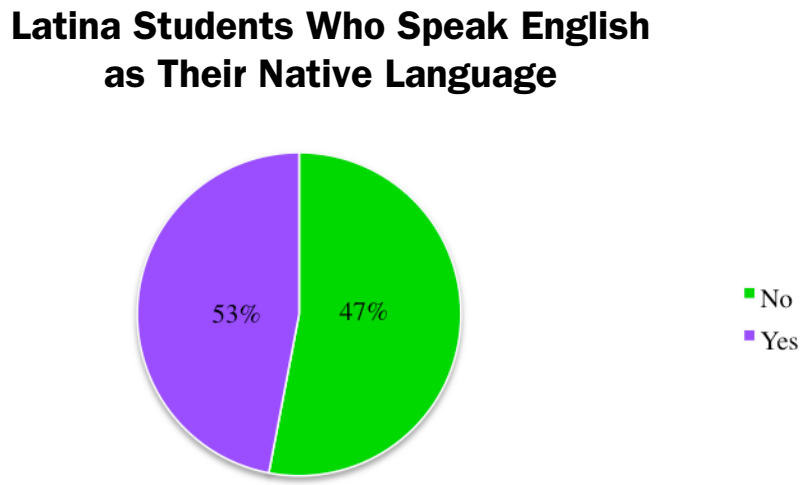
APPENDIX



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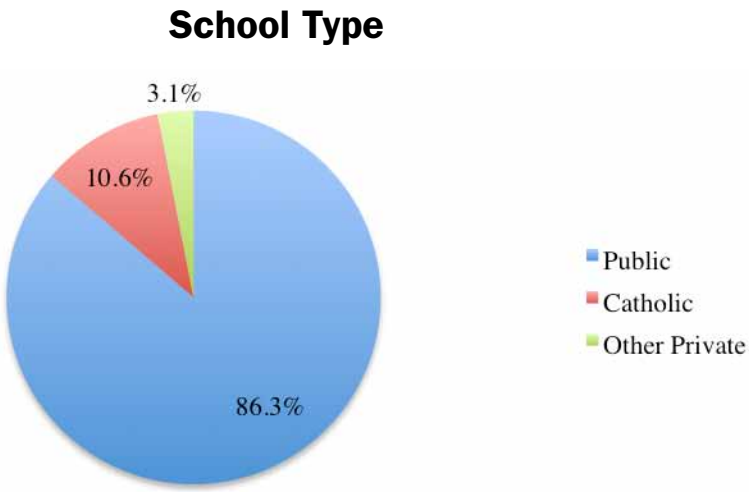

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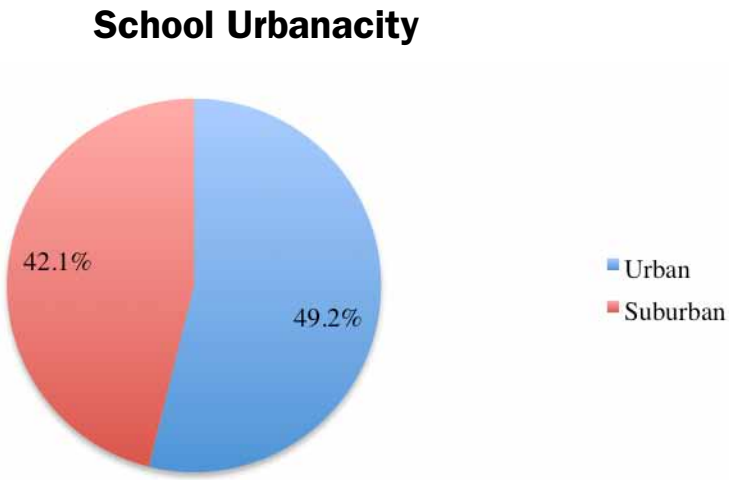

Education Longitudinal Study, 2002

The Geomorphic Settings of Known Archaeological Sites in the Lower Grand River Valley, Ottawa County, Michigan

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Abstract

To predict undiscovered archaeological sites in the Lower Grand River, we mapped known archaeological sites using color and infrared aerial photos, digital raster graphics, and digital elevation models. We interpreted the geomorphic settings of sites using this preliminary geographic information system. We found both spatial and temporal patterns in site location.

The Lower Grand River valley is cut into Quaternary glacial sediments that formed in front of the retreating Laurentide ice sheet roughly ~16,000 to 13,000 years before present (B.P.). The first inhabitants were the Paleo-Indian culture, which occupied the valley ~11,000 B.P. The following Archaic period spans from ~10,000 to 5,000 B.P. Between ~6,000 and 5,000 B.P., a transgression inundated much of the Lower Grand River Valley. By ~4,000 B.P., Lake Michigan had reached its current level, resulting in down cutting of the Grand River. The evidence for this is a stream terrace at elevations between 590 and 610 feet a.m.s. For the last 4,000 years, the base level of the river has stayed relatively the same, and lake levels have fluctuated by about two meters. The following Woodland (~3,000 to 400 B.P.) and Historic periods had a climate similar as present.

The frequency of sites in the valley decreases from higher elevations to lower elevations. The majority of the sites are from the Woodland and Historic periods, and they occupy all surfaces. Most sites are associated with resource gathering and camps, while larger, more permanent occupations are located on alluvial surfaces within the valley.

Introduction

The prehistoric and historic occupation of Ottawa County, Michigan is directly associated with the Grand River. The discovery of archaeological sites along this stretch of river has relied upon the intuition and diligence of many archaeologists in the twenty-first century (Brashler and Mead 1996). One frequently used method of discovering archaeological sites has been surveys (Brashler and Mead 1996). Traditional surveys are often used in which individuals scan the surface for artifacts. The preferred method is shovel testing, which involves shallow pit testing at a determined interval along a series of transects. The fruits of these labors have resulted in the discovery of a rich archaeological record with numerous sites found by amateurs, professionals, and cultural resource management firms. The development of Ottawa County in the last century has damaged this irreplaceable resource (Kingsley 1981). It is likely that a majority of the archaeological sites along this section of the Grand River have been destroyed (Kingsley 1981).

The goal of this study is to better understand the distribution of archaeological sites in the region with respect to their relationship to the geomorphic setting. By entering known site locations surrounding the Grand River in Ottawa County into a geographic system program, we produced a geographic map. From this map, we assigned these sites to different categories based on our interpretations of the geomorphic landscapes they occupy. Through the analysis of this map, we found both spatial and temporal relationships. It is the effort of this study to aid future work in the area by limiting the amount of time spent on locating undiscovered sites.

The Grand River is the most extensive river system in Michigan, and the watershed incorporates roughly 5,572 square miles. The Grand River's watershed covers almost a third of the southern portion of Michigan's Lower Peninsula and

extends from the western shores of Lake Michigan well into the center of the state. Although the Grand River flows westward towards Lake Michigan, its many tributaries offer access to other nearby rivers that flow toward eastern Great Lakes, such as Lake Huron and Lake Erie (Brashler and Mead 1996). Due to the size of the Grand River watershed, it has been influential in the exploration and later migration of cultures during prehistoric and historic times (Brashler and Mead 1996).

The stretch of the Grand River that is the focus of this study begins down river from an 18 foot drop in river elevation at the former rapids of Grand Rapids, Michigan, until it reaches its effluence with Lake Michigan in the city of Grand Haven. Between these two points, the Grand River Valley is eroded entirely in Quaternary glacial sediments. Bedrock in Ottawa County is buried by anywhere from 50 to 350 feet of glacial sediments (Colgan and Stark 2005; Colgan 2008). Bedrock units encountered directly below glacial sediments in Ottawa County are of the Coldwater Shale, the Marshall Sandstone, and the Michigan Formation (Milstein 1987).

Figure 1: The area of study is located in Western Michigan as the Grand River enters Ottawa County and reaches its mouth into Lake Michigan in the city of Grand Haven.

Geomorphic History

Michigan has been glaciated at least a dozen times during the Quaternary Period ~2.5 million years to ~11,000 years ago, but only deposits of the last glaciation have conclusively been dated in Michigan (Larson and Schaetzl 2001). In the western Great Lakes region, in states such as Wisconsin, there is evidence for at least six glaciations (Syverson and Colgan 2004).

The last glacial cycle of the current ice age (called the Wisconsinan Glaciation) began about 115,000 years ago and ended approximately 11,000 years ago. This glaciation had two cold phases in the early and late Wisconsinan with one warmer phase when the ice temporally retreated (the middle Wisconsinan). The early Wisconsinan Glaciation reached maximum ice extent between 80,000 to 65,000 years ago. Evidence for an early Wisconsinan glaciation in Michigan is equivocal (Eschman 1980; Winters, et al. 1986). The late Wisconsinan Glaciation began about 35,000 years ago, and most of the surface glacial sediments in Michigan are probably of this age. Ice reached its late Wisconsinan maximum approximately 23,000 years ago (Mickeslon, et al. 1983). At this time ice extended all the way to central Illinois and southern Indiana. The state of Michigan was probably covered with at least 1000 meters of glacier ice at this time (Clark 1992). By 16,500 the ice sheet was rapidly retreating, and the terminus of three ice lobes were retreating back into Michigan, the Lake Michigan, Saginaw, and Erie Lobes (Mickelson, et al. 1983).

During deglaciation the Grand River Valley was probably formed as a proglacial valley, carrying meltwater from the retreating Saginaw Lobe (Bretz 1953; Kehew 1993). As the ice sheet retreated out of the lowlands that would become the Great Lakes, large glacial lakes formed in front of the retreating ice. Three glacial lakes existed in Michigan from about 16,500 to 13,000 years ago. These were from west to east: Glacial Lakes Chicago, Saginaw, and Whittlesey (Mickelson, et al. 1983). During deglaciation the Grand River valley served as a spillway for lake overflows that carried water from Glacial Lake Saginaw to Glacial Lake Chicago (Bretz 1953; Kehew 1993). During this time the Grand River was an unpredictable environment, with flashy discharge, braided channels, and uplands covered by bare sediment and/or tundra. Broad high river terraces made up of sand and gravel along the lower Grand River provide evidence of this stage (Bretz 1953).

By 12,500 years ago, the climate warmed enough for the tundra to disappear, and spruce and pine took a foothold in the landscape (Clayton, et al. 2001; Howard 2010). Pollen records show that by 11,000 years ago, forests dominated by spruce and pine covered most of Michigan (Kapp 1999), and after 8,000 years ago mixed deciduous forests of pine, oak, hickory, and beech spread into the area (Kapp 1999). During the Holocene the river came to be more like its modern form. Seasonal discharge combined with low sediment load led to a slightly meandering stream with wide shallow channel, point bars, and cut off channels.

Human History

The Grand River extends through most of Lower Michigan, and this geographic position would have made it a locus of many different needs of prehistoric residents (Brashler and Mead 1996). It has been suggested that the Grand River was used extensively for transportation through a great portion of Michigan due to the extent of its length and its east-west bearing (Brashler and Mead 1996). Associated with the Grand River are many natural resources that would have attracted the attentions of local populations (Brashler and Mead 1996; Kingsley 1981). In the Lower Grand River, there are many different environments that produce resources, such as water fowl, and fish in wetlands (Brashler and Mead 1996). This includes local stands of nut bearing trees such as oak and hickory, and the sap of sugar maple (Brashler and Mead 1996). These stands of trees would have offered a bounty of resources during different seasons (Brashler and Mead 1996). These readily available resources imply that archaeological sites were most likely located throughout the drainage basin and were related to the exploitation of the landscape (Brashler and Mead 1996).

Archaeological investigations of the Grand River basin began in the later portion of the 19th century and have received sporadic attention since then (Brashler and Mead 1996). Kingsley's (1981) study of the spatial occurrence

of Middle Woodland sites in southern Michigan produced a model centered on resource gathering being the primary factor in site location. These environmental factors produce a predictable site model that places "village" sites on stream terraces and levees within the flood plain, while mounds and other earthworks are found in higher elevations (Kingsley 1981). Kingsley's (1981) model describes the geographic position of "villages" on well drained soils that are not frequently flooded, yet these are the same places that are commonly farmed, which most likely has disturbed or destroyed many of these sites (Brashler and Mead 1996). With further survey and the use of "deep-testing," it is possible, if not probable, that buried horizons that were once occupied by ancient peoples can be discovered (Brashler and Mead 1996).

Here we explore the relationship between the location of archaeological sites and their relationship to the geomorphic settings. As mentioned above, the use and occupation of the Lower Grand River is reflected in the geographic and geomorphic landscapes the sites occupy. We have explored the spatial and temporal relationships of all known archaeological sites in the study area and discovered trends that can be used in future land management and archaeological studies.

Methods

In order to better understand site location and frequency along the Grand River in Ottawa County, Michigan, townships were chosen by their relative geographic proximity to the river. All but two of the townships in the study area include the Grand River within the township borders. Two townships that were originally considered were disregarded because of the absence of archeological sites. The townships that are included are as follows: Allendale, Blendon, Crockery, Georgetown, Grand Haven, Polkton, Robinson, Spring Lake, Tallmadge, and Wright.

ESRI product ArcGIS 9.3.1 was used to digitally map all of the data collected. The digital raster graphic, digital elevation model, and orthorectified aerial photos used to produce the base map were accessed online from the Center for Geographic Information Department of Information Technology's Michigan Geographic Data Library. The projected coordinate system for the base map is the NAD 1983 Hotline Oblique Mercator Azimuth Natural. The individual site locations were input separately into the base map from notes and copied USGS topographic maps attained through the Michigan Office of the State Archaeologist, MSHDA. I was assisted by the Assistant State Archaeologist in accessing the state archaeological site file.

The archaeological site files contain an abundance of information, which is represented in Table 1. After the construction of the base map, the individual sites were compiled into a data base. The study data base contains only relevant data from the archaeological site that is pertinent to this study. Two categories were created for the study database. The first of these is if the site was considered to be insubstantial. An insubstantial site is determined by an extremely low artifact density. The interpreted geomorphic category is the second addition.

One hundred and eighty archaeological sites were input into the base map. Due to the absence of exact locations reported in the state archaeological files, some sites were placed in the designated area that were indicated on the topographic maps held at the Office of the State Archaeologist. Once the sites were entered into the base map, they were interpreted into six categories based on what geomorphic landscape they occupied. One of the categories is the *Modern Floodplain* for sites that are found close to the river and have low elevations. Another category is *Levees and Splays*. These geomorphic landforms are not included in the modern floodplain category because they have a notable rise in elevation above the modern floodplain. Sites found near and on a river terrace that occurs between 590 and 610 feet above the median sea level are designated as the *Pleistocene terrace 1* (Pt1). Most sites that are located well above the modern floodplain, often signified by an extreme increase in elevation, are categorized as *Uplands*. Sites found on an isolated landform that exhibit a drastic increase in elevation are noted as *Pleistocene terrace 2* (Pt2); this is a unique landform which is detached from the uplands. The final category is the *Artificial slope*. This is a designation for the few sites that are found on manmade landforms.

Results

The first inhabitants of Michigan are known as the Paleo-Indians, and their presence is only traceable by distinct cultural materials (Shott and Wright 1999). These early inhabitants probably arrived in Michigan around 12,000 and 10,000 B.P. as soon as the area became ice free, yet it is important to note that there are only five published sites that provide evidence for this early occupation (Shott and Wright 1999). The amount of evidence for Paleo-Indian occupation found in the archaeology site files of the study area is limited to a few sites. One site is a single find spot in which a fluted biface projectile point has been located and identified as a Hi-Lo point (Flanders 1983). Hi-Lo points are considered to be a material culture that lies on the ambiguous differentiation between the Paleo-Indian and Early Archaic periods; it is a fluted biface point. The site in which points take their name from is located in Macomb County, Michigan (Monaghan and Lovis 2005; Shott 1999). A fluted biface point is a projectile point that has one or more channels running the length of the point which are produced when "flakes" have been deliberately removed to secure the point to a shaft (Shott and Wright 1999). The Paleo-Indian period in Michigan is one of the shorter periods and only lasts roughly 2,000 years in Michigan (Shott 1999). As the environment changed with the further deglaciation of the region, the inhabitants changed their economy and subsistence patterns to the demands of this new environment (Shott 1999).

The Archaic period follows the Paleo-Indian period, which spanned from 10,000 to 5,000 B.P. (Monaghan and Lovis 2005). The Archaic period is divided into three subcategories designated Early, Middle, and Late, which are separated by changes in environment and subsistence patterns (Shott 1999; Lovis 1999; Robertson, et. al.1999). The division of the Archaic period and the Paleo-Indian period is barely distinguishable, and the demarcation of these two time periods is based on

the absence of biface fluting in their lithic industry (Shott 1999). The sub-sectioning of archaeological periods can be deceiving, in that it can at times blur the lines of interpretation in which some subsections are considered to stand alone, and inferences drawn across the periods may be neglected (Shott 1999). Although this approach to studying the past has its limitations, it does break up the volumes of information into easier, more approachable shorter periods of time (Shott 1999).

As the Archaic period unfolded in Michigan, many changes occurred in how these early inhabitants interacted with their environment. The most important of these is the change in subsistence patterns, the evolution of the lithic industries, the use of ground stone tools, and the trade in native copper, this diverse collection of artifacts reflecting a broader spectrum of subsistence (Shott 1999; Lovis 1999; Robertson, et. al.1999). At this time, the water levels of the Great Lakes were in a constant flux, and it is likely that many Archaic period sites have either been inundated or buried under alluvium (Shott 1999). This apparent absence of sites has resulted in interpretations of Michigan's Archaic population as sparse due to the climate (Shott 1999). This interpretation has been largely discredited by accommodating the Archaic Sites that are not currently accessible (Shott 1999).

The sophistication of subsistence patterns during the Archaic period focused on hunting and gathering, and it began to shift toward cultigens during Woodland period (Garland and Beld 1999). The Woodland period is also subdivided into Early, Middle, and Late (Monaghan and Lovis 2005; Garland and Beld 1999; Holman and Brasher 1999; Kingsley 1999; Stothers 1999). Traditionally, the introduction of pottery into the tool set of these early peoples demarkates the Woodland period from the Archaic (Garland and Beld 1999). In Michigan, pottery began to appear in the archaeological record around 2500 B.P. (Garland and Beld 1999). The subsistence patterns during this period began to utilize cultigens, such as squash and sunflower (Garland and Beld 1999). Another distinguishing feature of the Woodland period is the use of burial mounds in mortuary practices and the construction of earthwork enclosures (Halsey1999). This suggests that there was an increase in social interactions as time progressed into the Late Woodland (Garland and Beld 1999).The use of burial mounds in parts of the state reflects what is considered to be Hopewell tradition (Kingsley 1999; Halsey 1999). The extensive use of burial mounds and the adoption of the Hopewell tradition likely represent influences from southern cultures in Michigan's Lower Peninsula (Kingsley 1999; Halsey 1999). At the culmination of the Woodland period, the social structures which European traders and other explorers would find were developing and thriving in the region (Holman and Brashler 1999).

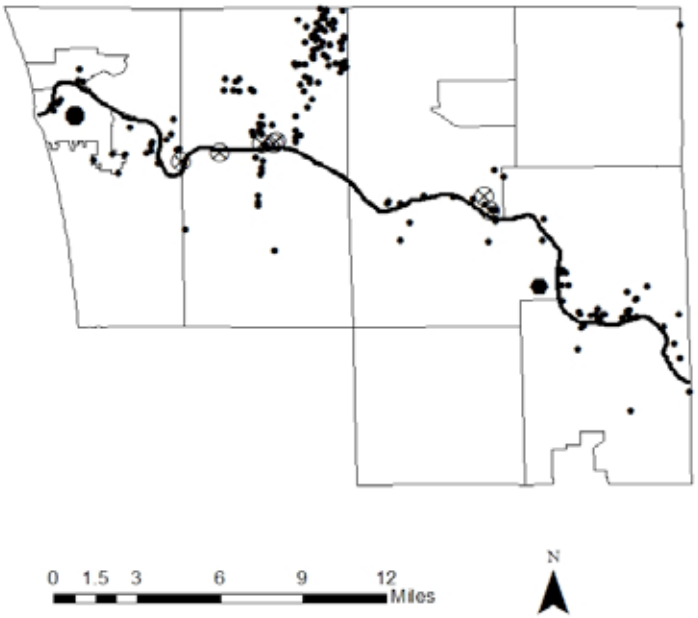

Figure 2. The resulting geographic map displayed here depicts the archaeological sites as small black dots. Village sites are circles with X in the center. The Grand River is the dark line winding east-west through the map. The GVSU campus is the large black hexagon in the eastern portion of the map and the other hexagon is the city of Grand Haven.

The final archaeological period in Michigan is the Historic period, which begins in the mid-seventeenth century and continues till modern times (Cleland 1999). The division of the Historic period is very different from the others because it is subdivided by known cultural affiliations. Some Historic archeologists focus on the discovery of the complex relationship between the Native Americans and the European military, explorers, traders, settlers, and missionaries during the settlement of Michigan (Cleland 1999). The Historic period is divided into subcategories by individual Western powers that become influential in the region, and they include the French, British, and American periods (Heldman, et. al. 1999; Pilling and Anderson 1999; Branster 1999). The Historic period contains the most complex archaeological record and is aided by historic writings.

One of the results of this study is a preliminary geographic map (Figure 2), which we used to interpret the geomorphic settings of each site. The map illuminates the relationship between archaeological site locations and their proximity to the river and its tributaries. A significant portion of the sites are found near the river itself. Sites that have been identified as villages are all located near the river. A majority of the sites are found near the many tributaries to the Grand River. The tributary known as Crockery Creek exhibits the highest frequency of sites. There is one notable exception to this trend, which lies in the north east portion of the study area. It occurs on the shore of a naturally occurring lake called Cranberry Lake. A series of sites across from Crockery Creek appear to form a linear feature. This resulted from the parameters of a survey in that area which was conducted by a cultural resource management firm, and it does not represent a tributary to the river.

All prehistoric and historic periods are found within the study area. Sites from more recent periods are more prevalent (Figure 3). The frequency of sites within the different geomorphic categories discloses that a majority of the sites lie on the uplands (Figure 4). The relationship is less drastic after insubstantial sites are not considered (Figure 5). Most of the remaining sites occupy lower elevations near or on the modern flood plain.

The sites exhibit different trends in geomorphic classification in each archaeological period (Figure 6). Paleo-Indian Period sites rarely occur and are not located below the Pleistocene Terrace 1. Woodland and Archaic Period sites follow a similar trend with the largest number of sites occupying the Uplands, with progressively fewer sites as the elevation decreases. The Historic period does not follow this trend. It is the only period that has a site on an artificial slope. Most of the Historic sites occupy both the uplands and the modern flood plain in high frequency while having a significant number of sites on the Pleistocene terrace 1.

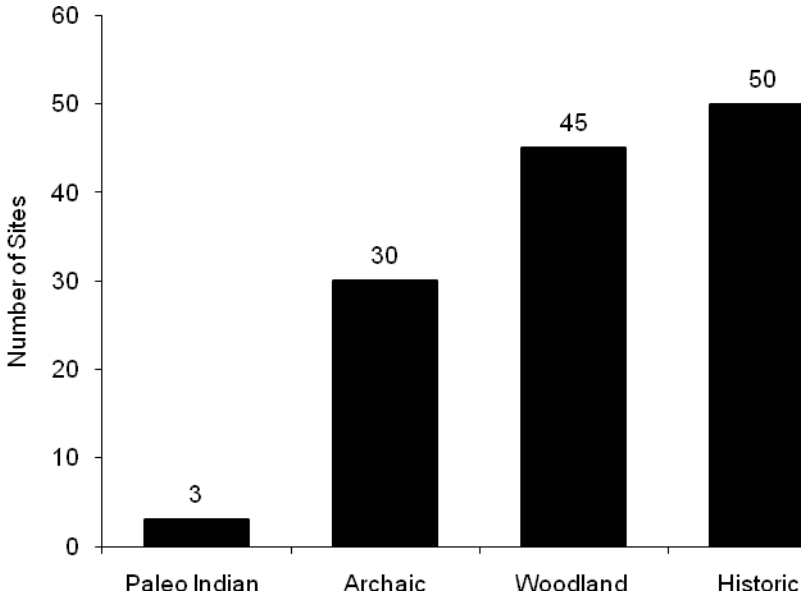

Figure 3. The histogram represents the number of sites within the study area and how they relate to the archaeological periods present in the area.

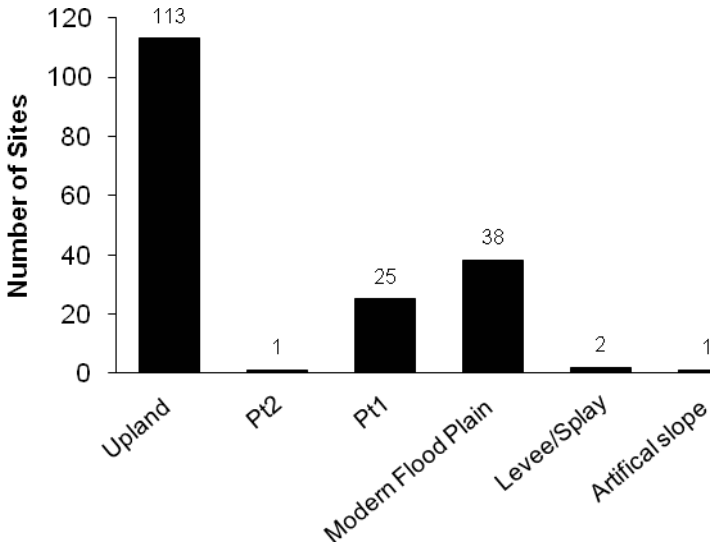

Figure 4. This represents all the archaeological sites categorized into their geomorphic and environmental settings.

Discussion

A significant finding of this study is that site location has a tendency to congregate along the various tributaries to the Grand River. The utilization of the riverine system in prehistoric times is most likely tied to the substance patterns of the individual groups. Brashler and Mead (1996) mention that, in the Woodland period, the riverine systems of the Lower Grand River likely produced ample waterfowl and fish as well as important trees, such as sugar maple. A majority of the sites associated with the small tributaries are light in artifact density and are commonly identified as camp sites or collection sites. This supports the argument that it was a source of subsistence.

All of the village sites that are in the study area are found near the Grand River and its tributaries. All but one of the village sites is prehistoric in age. These prehistoric villages are found on elevated terrains near the river. This supports Kingsley's (1981) argument that the villages are found on these well drained soils. These sites are the likely origins of the individuals who produced the smaller sites throughout the study area.

The increase in site frequency from early periods to more recent times could be interpreted as a gradual increase in population. This evidence may be misleading because of the changing environmental conditions during the Archaic period, which experienced a transgression of lake water into the lower Grand River that likely buried or destroyed sites in the lower elevations of the river (Shott 1999; Monaghan and Lovis 2005). There are fewer Archaic sites on the modern flood plain, which may support Shott's (1999) theory that some of the sites have been destroyed or buried. This destruction would skew the interpretation of population sizes during prehistoric times. Future exploration of the region for archaic sites should keep in mind that exploring for their sites in lower elevation may require more extensive excavation.

Like past archaeological work, future excavation in the lower Grand River will be driven by either the necessity of cultural resource management or research interests. Due to this, some of the data that is persevered within the Archaeological Site files of the Michigan Archaeologist may be skewed to favor one particular archaeological period. The diligence of decades of work has produced a comprehensive understanding of the region. Although it has been driven by various methods and research goals, the overall picture covers all the terrains that were scrutinized in this study. Future archaeological work in the area would benefit from diversifying the areas in their study to include terrains from the modern flood plain to the uplands. All of the archaeological periods are found in the uplands, and, although more artifact dense village sites are found in the low lands, not investigating the uplands could result in a misinterpretation of subsistence patterns.

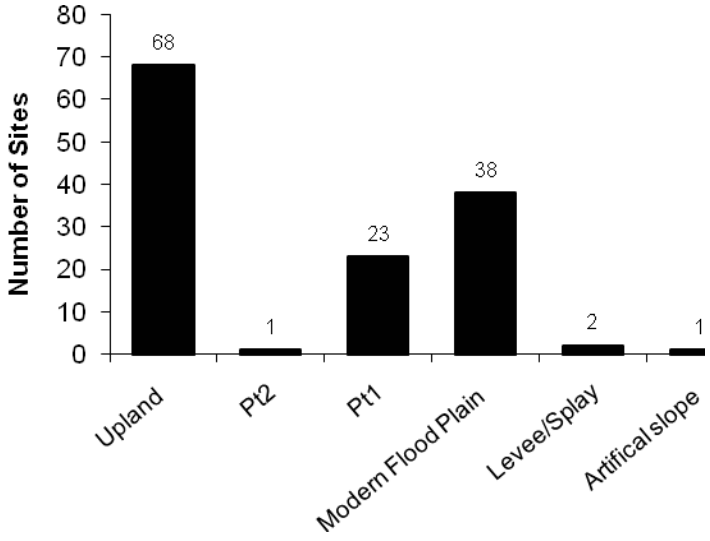

Figure 5. Archaeological sites that contain significant amount of material culture are categorized into the different geomorphic settings.

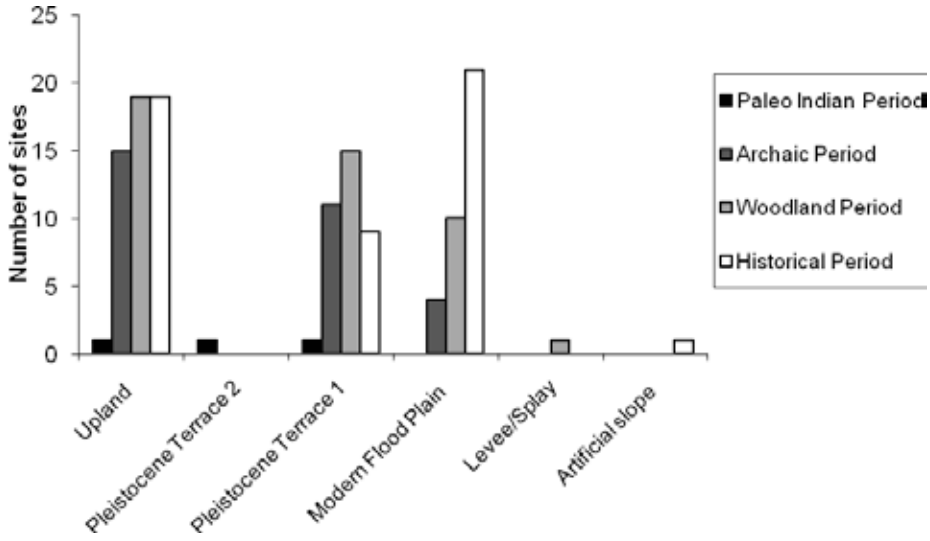

Figure 6. Archaeological sites that have been sufficiently identified and categorized into a known cultural period are placed into their geomorphic and environmental settings.

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Kappa Opioid Regulation of Stress-Related Behavior

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Abstract

Anxiety disorders affect roughly 40 million American adults in a given year. Those suffering from anxiety disorders often experience additional stress-linked illnesses, such as depression. Previous research has shown that stress exposure increases levels of the endogenous neuropeptide dynorphin, which the kappa opioid system is selectively activated by. This study examined the role of the kappa opioid system in regulating stress-related behavior using the elevated plus-maze. Behavioral stress responses were examined in male Wistar rats following i.p. administration of opioid agonist U-50,488 (0 or 10 mg/kg). Subjects were pretreated with the kappa opioid antagonist nor-binaltorphimine (nor-BNI) 24 hours prior to testing in the elevated plus-maze (0 or 20 mg/kg). Injections of 10 mg/kg U-50,488 significantly decreased percent open arm time compared to controls, an effect reversed by pretreatment with 20 mg/kg nor-BNI ($F(1,44) = 6.10$, $p < 0.05$). A main effect of nor-BNI was found on the total number of arm entries ($F(1,44) = 11.73$, $p < 0.05$). Further analysis revealed that pretreatment with nor-BNI led to an increased number of arm entries in rats injected with U-50,488. The nor-BNI sensitivity of the behavioral responses suggests an activation of the kappa opioid receptors by a stress-induced release of dynorphin. The results indicate a relationship between kappa opioid receptors and stress-related behaviors and illustrate the potential therapeutic value of targeting the kappa opioid system in the treatment of anxiety and other stress-related disorders.

Introduction

Anxiety disorders affect roughly 40 million American adults (about 18% of the US population) in a given year (Kessler, 2005). In addition, those suffering from an anxiety disorder often experience comorbidity with other stress-linked mental illnesses such as depression and alcohol and drug abuse, suggesting that stress is a critical component in the development of these disorders.

A classic definition of stress is any response to demands, usually noxious, placed on the body (Selye, 1936). An alternate definition describes stress as any alterations in the psychological homeostatic process (Burchfield, 1979). Although exposure to certain levels of stress is a normal occurrence in everyday life, chronic stress can lead to the development of psychiatric disorders, such as anxiety and depression (Hennessy & Levine, 1979). Stress has been found to increase the release of several endogenous neurochemicals, including dynorphin (Nabeshima, et al., 1992), a neuropeptide that binds with high affinity to kappa opioid receptors (Chavkin, et al., 1982).

Recent evidence suggests the involvement of the dynorphin/kappa opioid receptor (KOR) system in mediating the stress responses. McLaughlin, et al. (2003) investigated the involvement of the kappa opioid system in the stress response by examining the behavior of mice subjected to forced swim stress. Mice lacking the prodynorphin gene showed a significant reduction in stress-induced immobility, an indication of depression-like behavior, in the forced swim test. Similar results were found in mice pretreated with the kappa opioid antagonist nor-binaltorphimine (nor-BNI). In addition, tests using social defeat stress (SDS) found prodynorphin knockout mice and those that received nor-BNI pretreatment to spend significantly less time in socially defeated, immobile postures (McLaughlin, et al., 2006). Taken together, these results implicate a role of the dynorphin/KOR system in behavioral responses to stress.

The dynorphin/KOR system has also been examined in stress-related reinstatement of drug seeking (Beardsley, et al., 2005; Valdez, et al., 2007). The KOR antagonist JDTic was found to block stress-induced reinstatement of cocaine seeking. It also decreased time spent immobile in the forced swim test, suggesting the antistress potential of KOR antagonists (Beardsley, et al., 2005). Another study found that the KOR agonists spiradoline and enadoline led to reinstatement of cocaine-seeking behavior in squirrel monkeys, but this effect was not reversed by the antagonist nor-BNI (Valdez, et al., 2007). These results suggest a possible mediation of stress-related behavior by a subpopulation of kappa opioid receptors. However, blockade of corticotropin releasing factor and norephinephrine, two brain systems also thought to be mediators of the stress response (Koob, 1999), prevented spiradoline-induced reinstatement. Although these findings suggest that brain kappa opioid system is involved in the regulation of stress-related behaviors, additional research is needed to understand the role of the KOR system.

The purpose of this study was to examine the role of the kappa opioid system in regulating behavioral responses to stress. The effects of U-50,488 on stress-related behavior were examined in the elevated plus-maze, a classic animal model of anxiety (Pellow & File, 1986). In addition, the effects of the selective antagonist nor-BNI administered as a pretreatment to U-50,488 were examined. The results of this experiment reveal the ability of nor-BNI to reduce stress-induced increases in anxiety-like behavior, suggesting that kappa opioid mechanisms are involved in the regulation of behaviors induced by external stressors.

Materials and Methods

Animals and Housing

Male Wistar rats (Charles River, Kingston, NY; n=45) weighing 150-200 g upon arrival were used in this experiment. Rats were habituated to colony housing 14 days prior to testing. Rats were housed in groups of 2-3 per cage with food and water available *ad libitum*. Rats were handled and weighed daily to minimize any stress associated with the experimental procedure. Animals were maintained on a 12-hr reverse light/dark cycle (lights on at 10:00 PM).

Apparatus

The elevated plus-maze (Med Associates, St. Albans, VT) measures unconditioned approach-avoidance behavior during exploration of a novel environment in rats (Pellow & File, 1986). The apparatus was made of dark Plexiglas and consisted of four arms (50 cm long X 10 cm wide). The two enclosed arms had 40 cm high dark walls, whereas the two open arms had 0.5 cm high ledges. The maze was elevated to a height of 50 cm.

Drugs

U50-488 [(*trans*)-3,4-dichloro-*N*-methyl-N-[2-(1-pyrrolidinyl)-cyclo-hexyl] benzeneacetamide; Tocris Biosciences, Ellisville, MO] and nor-binaltorphimine (nor-BNI; Tocris Biosciences, Ellisville, MO) were dissolved in 0.9% saline solution for i.p. injections.

Behavioral testing procedure

Rats received intraperitoneal (i.p.) injections of nor-BNI (0 or 20 mg/kg) at least 24 hours prior to testing in the elevated plus-maze. This pretreatment period was chosen because previous research has shown that nor-BNI is most selective for kappa opioid receptors at 24 hours as opposed to earlier time points (Endoh, et al., 1992). On the day of testing, rats were further divided into groups receiving different doses of U-50,488 (0 or 10 mg/kg). Injections of U-50,488 took place 10 minutes prior to testing in the elevated plus-maze.

To examine anxiety-like behavior and general motor activity, rats were placed individually onto the center of the apparatus facing a closed arm. The time spent on and entries onto each arm were recorded automatically by photocell beams and monitored by a computer for 5 minutes. The percentage of time spent exploring the open arms has been proposed to relate inversely to an anxiety-like state, whereas the number of arm entries measures general locomotor activity (Pellow, et al., 1985).

Data Analysis

Data were analyzed using two-way analysis of variance (ANOVA) with dose of U-50,488 and dose of nor-BNI as between subjects factors. Further analysis was performed using the Tukey's *post hoc* test as warranted.

Results

There was a significant interaction between U-50,488 dose and nor-BNI dose on the percentage of time spent exploring the open arms of the elevated plus-maze ($F(1,44) = 6.10$, $p < 0.05$, Figure 1).

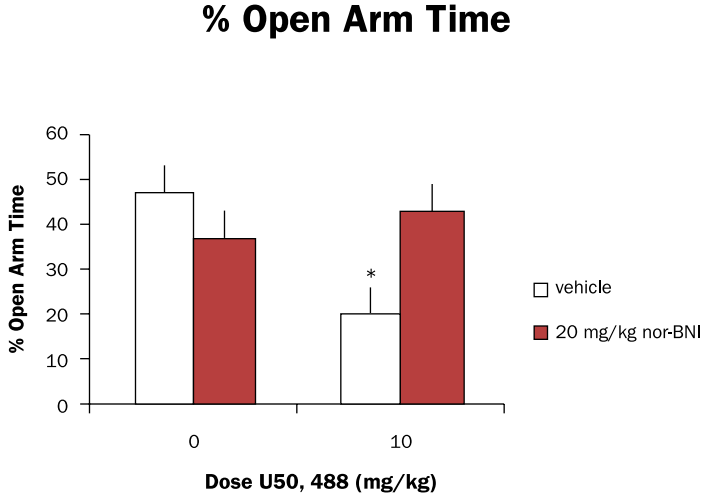

Figure 1. Effects of U-50,488 and nor-BNI on percent of time spent on the open arms of the elevated plus-maze. Rats were pretreated with nor-BNI or vehicle at least 24 hours prior to injection of U-50,488 (0 or 10 mg/kg). Injections of U-50,488 occurred 10 minutes before testing in the elevated plus-maze. Percent open arm time was calculated as the percent of open arm time / (open + closed) arm time. * $p < 0.05$ compared to vehicle, 0 mg/kg U-50,488 group, Tukey's test.

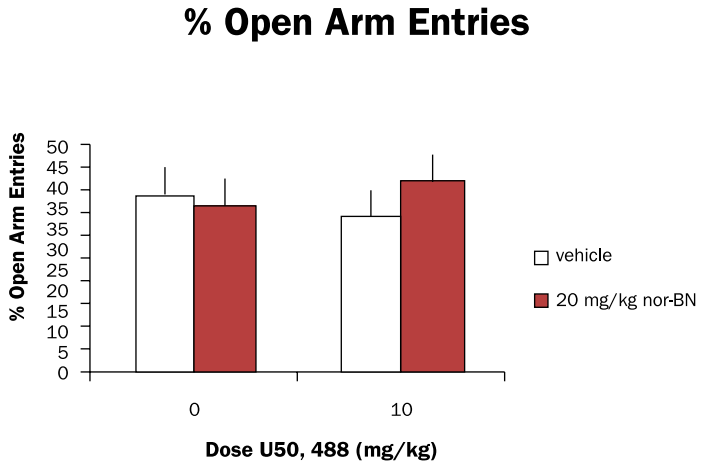

Figure 2. Effects of U-50,488 and nor-BNI on the percent of open arm entries in the elevated plus-maze. Rats were pretreated with nor-BNI or vehicle at least 24 hours prior to injection of U-50,488 (0 or 10 mg/kg). Injections of U-50,488 occurred 10 minutes before testing in the elevated plus-maze. Percent open arm entries was calculated as the number of open arm entries / (open + closed) arm entries. Neither U-50,488 or nor-BNI significantly altered the percentage of open arm entries. the elevated plus-maze. Percent open arm time was calculated as the percent of open arm time / (open + closed) arm time. * $p < 0.05$ compared to vehicle, 0 mg/kg U-50,488 group, Tukey's test.

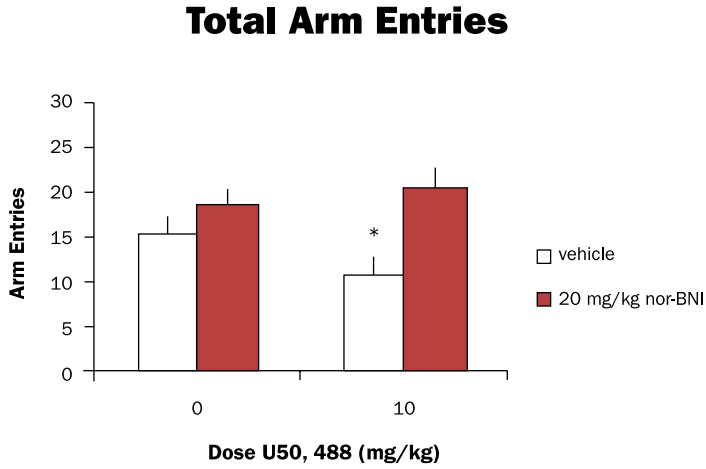

Figure 3. Effects of U-50,488 and nor-BNI on total number of arm entries. Rats were pretreated with nor-BNI or vehicle at least 24 hours prior to injection of U-50,488 (0 or 10 mg/kg). Injections of U-50,488 occurred 10 minutes before testing in the elevated plus-maze. * $p < 0.05$ compared to vehicle, 10 mg/kg U-50,488 group, Tukey's test.

Injections of 10 mg/kg U-50,488 significantly decreased percent open arm time compared to controls, an effect reversed by pretreatment with 20 mg/kg nor-BNI. No significant effects of U-50,488 or nor-BNI on the percentage of open arm entries were found (Figure 2).

A main effect of nor-BNI was found on the total number of arm entries ($F(1,44) = 11.73$, $p < 0.05$, Figure 3). Further analysis revealed that pretreatment with nor-BNI led to an increased number of arm entries in rats injected with U-50,488.

Discussion

The principle finding of this study is that the kappa opioid agonist U-50,488 decreased open arm exploration in the elevated plus-maze, and this effect was attenuated by the kappa opioid antagonist nor-BNI. These results suggest that stress-related behaviors are at least in part mediated by the activity of the endogenous kappa opioid system.

The time spent exploring the open arms of the elevated plus-maze can be considered a measure of emotionality. Rats naturally prefer the enclosed arms of the maze and spend more time in closed arms than in the open arms (Pellow, et al., 1985). Figure 1 illustrates a significant decrease in the amount of time spent on the open arms by rats treated with 10 m/kg of U-50,488 compared to those that received no treatment. This decrease in activity caused by U-50,488 indicates an increase in an anxiety-like state in the rat. We can conclude that the reversal of the effects by the kappa opioid antagonist nor-BNI is not due to a different opioid system, given that nor-BNI has been shown to exhibit maximum selectivity of kappa opioid receptors 24 hours after injection (Endoh, et al., 1992). This finding is consistent with previous studies that have found nor-BNI to reverse the effects of U-50,488 on the reinforcing efficacy of cocaine (Mclaughlin, et al., 2003, 2006a, 2006b; Negus, 2004).

The results failed to indicate a significant effect of U-50,488 or nor-BNI on percent of open arm entries. The percent of open arm entries is thought to be a measure of anxiety, given that anxiolytic compounds would be expected to increase the number of open arm entries without increasing the exploration of the enclosed arms (Pellow, et al., 1985). Although we did not achieve significant results in the percent of open arm entries, this measurement was not validated to correlate with other measurements of anxiety, like the number of arm entries or time spent on the open arms (Pellow, et al., 1985).

The total number of arm entries on the elevated plus-maze is a measurement of general locomotor activity of the rat (Pellow, et al., 1985). Previous research has suggested that altering kappa opioid activity can lead to general untoward motor effects (Negus, 2004). Exposure to a novel environment such as the elevated plus-maze is in itself anxiogenic and can result in an increase in time spent immobile (Lister, 1987). Typically, rats exposed to stress in a novel environment exhibit a decrease in motor activity and an increase in anxiety-related behavior, such as freezing or immobility (Pellow, et al., 1985). However, nor-BNI led to increased locomotion in rats injected with U-50,488, suggesting that this overall increase in activity may be a further indication of

the anxiolytic effects of nor-BNI. The results revealed a main effect of nor-BNI on the total number of arm entries in the elevated plus-maze (Figure 3). If the total number of arm entries is an indicator of anxiety, then an increase in number of arm entries would suggest a decrease in an anxiety-like state in the rat.

In summary, U-50,488 produced anxiogenic-like properties in rats tested on the elevated plus-maze. The effects of U-50,488 were reversed by the kappa opioid agonist nor-BNI. These results indicate that the kappa opioid system is involved in the regulation of anxiety-like behavior in animals. Understanding the role of the kappa opioid system in the regulation of behavioral stress responses may be crucial in understanding the mechanisms of stress-related disorders and provide insight into the potential therapeutic value of targeting the kappa opioid system for treatment of anxiety and other stress-linked disorders.

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Group and Individual Performance on a Creativity Task: The Constraining Effects of Examples

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Abstract

Research has demonstrated that individuals provided with examples in a creative idea generation task tend to fixate on the most salient aspects of the examples and incorporate those features into their own creative products. The purpose of this study is to ascertain the extent to which this occurs within the context of interacting groups. The process by which groups generate creative products under two conditions was investigated, with examples provided and without. Groups were also compared to participants working alone. Participants were asked to create new creatures and toys either after having seen examples or not. They were then asked to choose their favorite toy and creature drawing. Participants who saw examples before beginning to draw created toy drawings with more features of examples than those who did not see examples. Individuals also created toy drawings with more fixated features than did groups. Participants who saw examples also chose toy drawings with more fixated features as their best than those who did not see examples. Groups who saw examples chose best drawings with significantly fewer fixated features than groups who did not see examples. Conversely, individuals who saw examples chose drawings with significantly more fixated features than those who did not. The first three creature drawings that groups created were compared to the fourth, fifth, and sixth creature drawings. Those who saw examples first created three creatures with more fixated features, but there was no effect of examples on the fourth, fifth, and sixth creatures drawn. The possible reasons for discrepancies between toy and creature drawings are discussed, as well as direction for future research.

Group and individual performance on a creativity task: *The constraining effects of examples*

Fixation occurs when previously learned information blocks the successful execution of any number of cognitive tasks, including problem solving and creative idea generation (Smith, 2003). A number of studies have explored fixation in a variety of contexts.

Sio and Rudowicz (2007) compared responses to remote association tasks (RATs) of experts and novices of a Chinese chess game, GO. RATs consist of three seemingly unrelated words which can be related by a fourth word. For example, "blue," "rat," and "cottage," are all related with the word "cheese." In their study, GO experts were distracted when the first two words presented were GO-related and the third was not. Experts performed worse on misleading RATs than non-experts and were more sensitive to the GO-related word that would solve for the first two words than novices, as shown by a lexical decision task performed later (Sio & Rudowicz, 2007). It seems that experts' knowledge of GO terms blocked successful access to non-GO related terms, thereby preventing the generation of a RAT solution. The internally-produced words became fixated and constrained their ability to come up with solutions.

Groups have been shown in a number of studies to perform better than individuals in problem- solving situations. There are a number of benefits of working in groups that lead to better problem- solving performance. For instance, groups benefit from cross-cuing, when one group member's memory triggers others to remember during collaborative recall. This is to the group's advantage when effective problem solving relies on memory (Smith, Bushouse, & Lord, 2010). Working with groups may also help break individuals away from fixation by offering varying perspectives. However, it is also likely that being exposed to group members' ideas could fixate the group, disabling them to

come up with future ideas (Smith, 2003).

Although there are a number of benefits to working with a group, in situations where misleading clues are given, individuals would be expected to perform better than groups because they are more likely to forget the misleading clue. In a study by Smith, Bushouse, and Lord (2010), rebus puzzles, a reliable tool for measuring insight (MacGregor, & Cunningham, 2008), were given to groups and individuals. Rebus puzzles are word puzzles that rely on spatial information to be solved. Some puzzles were accompanied by misleading clues and some with helpful clues. After a period of occupied time, individuals had forgotten more clues than groups (Smith, et al., 2010). However, pretest and posttest scores for completing rebuses for both individuals and groups improved, including on rebuses associated with misleading clues. This would support the idea that while clues were remembered, they may not have been fixated. This could also be explained by the possibility that some group members forgot the clues and were able to help their group solve the rebuses at posttest, while the group collectively could still come up with the misleading clue (Smith, et al., 2010). This study gives us some information about how fixation functions in group settings.

In a series of studies by Smith, Ward, and Shumacher (1993), participants were asked to create creatures to live on a planet just like earth and to imagine that they were employed by a toy company and create new toys. Some of these participants were shown examples before beginning to draw. The examples had certain features in common. For creatures it was the presence of four legs, antennae, and a tail, and for toys it was the use of electricity, exercise, and a ball. It was shown that individuals conformed to common features of examples when asked to generate their own creative drawings, even after a delay between when the example was shown and when they began drawing, and when asked explicitly to deviate from the examples given. This shows that common features of examples can be fixated in individuals and constrain creativity, even when attempting to work against it. It also shows that the conformity effects found could not be the result of participants assuming that their creations should resemble the examples shown to them; they simply could not forget the common features of the examples given (Smith et al., 1993).

The purpose of this study is to further the research done on fixation by using an experimental design similar to Smith et al.'s (1993) study of creativity, while extending it to include groups. While the previous study only addressed fixation in individuals, the purpose of this study is to explore whether groups or individuals produce work containing fixated features more often, and to understand what factors may lead to more or less creative groups. Will groups be fixated on features of samples similarly as the individuals in Smith's (1993) study? Or will they be able to deviate from the samples, while still recalling their features, as would be suggested by studies of group insight and fixation (Smith, et al., 2010)? In order to gain a better understanding of how group creativity is affected by the presence of examples, groups were video recorded during the procedure. From these videos, we were able to explore the process of group creativity. Examples are often given in professional settings to foster productivity (Smith, et al., 1993), making it important that we understand how to use examples to best serve that need.

Method

Participants

Two hundred twenty-two introductory psychology students were used as participants and were randomly assigned to work either in groups of three (N=174, 58 groups) or alone (N=48).

Design

Half of the participants were randomly selected to be shown examples for 90 seconds prior to beginning their drawings. They were then given 20 minutes to create as many new and creative drawings as possible. Each participant completed this procedure for creatures and for toys. Participants in the group condition were told before drawing that only one person could write or draw at any given time, in the interest of making their work the production of the group. The order of the type of drawing was chosen randomly so that about half of the participants created creatures first, while the other half first created toys. The creature examples had in common four legs, a tail, and antennae, while the toys had in common exercise, a ball, and electricity. After both tasks were completed, participants were asked to choose their best toy and creature and provide a reason for why they chose it.

After all data had been collected, drawings were content coded for presence of the fixated features: antennae, four legs, and tails for creatures, and electricity, balls, and exercise for toys. Coders were blind to the condition (examples shown or not) of the drawings being coded. Video footage of each of the groups was also coded. The order in which the drawings were created was recorded, as well as the presence of the fixated features. Similarly, the drawings that participants chose as their best were coded for presence of fixated features.

Results

The creature and toy drawings that participants chose as their best were analyzed using a 2 (condition: Group/Individual) X 2 (examples: Examples shown/No examples) ANOVA, for both the creature drawings and toy drawings. As expected, for toy drawings, there was a significant main effect of examples. Those who saw examples chose drawings with more fixated features (M=1.50, SD=.91) than those who did not see examples (M=1.19, SD=.72), $F(1,98)=3.90$, p=.05. There was no main effect of condition; those who worked individually chose best creatures with the same amount of fixated features (M=1.40, SD=.84) as those who worked in groups (M=1.23, SD=.82), $F(1,98)$=.458, p=.500.

With respect to the best creature drawings, there were no significant main effects. Groups did not differ from individuals in the number of fixated features found in the drawings they chose as their best (M=.85, SD=.85 and M=.76, SD=.95, respectively) $F(1,100)$=.215, p=.64. Those who saw examples (M=.86, SD=.86) also did not differ from those who did not see examples (M=.76, SD=.93) $F(1,100)$=.512, p=.47. There was a significant interaction effect, in that

groups who saw examples chose drawings with significantly fewer fixated features (M=.70, SD=.67) than groups who did not see examples (M=1.00, SD=.98). The exact opposite pattern was observed for the individuals. That is, individuals who saw examples chose drawings with more fixated features (M=1.04, SD=1.02) than those who did not (M=.50, SD= .81), $F(1,100)=5.91$, p=.01.

The total number of fixated features was analyzed using a 2 (condition: Group/Individual) X 2 (examples: Examples shown/No examples) ANOVA, again, separately for creature and toy drawings. The number of fixated features was calculated as a ratio of total fixated features in all drawings divided by the number of drawings created. This was done to ensure that the number of drawings created would not influence the number of fixated features attributed to each individual or group.

Within the creature drawings there was a marginal main effect of examples, such that those who saw examples created drawings with slightly more fixated features (M=.896, SD=.48) than those who did not see examples (M=.698, SD=.64), $F(1,100)=3.22$, p=.076. There were no other significant effects.

Within the toy drawings there was a significant main effect of examples, such that those who saw examples created toy drawings with more fixated features (M=1.37, SD=.52) than those who did not see examples (M=1.01, SD=.46), $F(1,97)=14.79$, p=.00. There was also a significant main effect of condition, such that individuals created drawings with more fixated features (M=1.296, SD=.599) than groups (M=1.09, SD=.42), $F(1,97)=5.29$, p=.02.

To investigate the differences in effects found between creature and toy drawings, additional analysis was carried out on the order of the drawings done. To investigate if the number of fixated features found in participants' creature drawings changed as they continued to create more drawings, a 2 (examples: Examples shown/No examples) X 1 (condition: Groups) ANOVA was used to analyze the first three drawings and second three drawings that were made.

For the first three creatures that were drawn by groups, there was a main effect of examples. Groups who saw examples created first three creatures with more fixated features (M=3.14, SD=1.67), than groups who did not see examples (M=1.83, SD=1.54), $F(1,38)=6.45$, p=.015. For the second three creatures that were drawn by groups, there was no main effect of examples. Groups who saw examples created fourth, fifth, and sixth creatures with the same amount of fixated features (M=1.33, SD=1.50) as groups who saw no examples (M=1.00, SD=1.41) $F(1,14)=.204$, p=.658.

Discussion

Overall, our results are somewhat unexpected. While we were partially able to recreate the findings of Smith et al.'s (1993) study with respect to the toy drawings, where individuals who saw examples created more drawings containing features of those examples, our other effects cannot always be explained by the presence of examples. For instance, when analyzing drawings of creatures, we only found a marginal effect of examples.

With respect to the drawings that participants chose as their best, the results show differing effects between creatures and toys. While there was a significant effect of examples on toy drawings, there was an interaction effect for creature drawings. We believe that these differences may be due to the types of examples that were given to participants. The features of the toy drawings that were common, and were coded as fixated features, were somewhat unconventional features for toys. However, the common features in the creature examples were conventional. We believe that when drawing creatures, participants who did not see examples could easily come up with features similar to the examples, and they included them in their drawings. Perhaps the pressure from being in a social situation led participants to include conventional features when in a group setting, while individuals felt more comfortable creating drawings more outside the norm. As Ward, Smith, and Finke (1999) reported, participants draw upon what is familiar to them when coming up with creative drawings: "…people's knowledge about the typical features of familiar categories structures their imaginative creations…" (p. 196). It is likely that people's ideas of what a "creature" looks like includes four legs, a tail, and antennae, so it is not surprising that these features would show up in drawings by participants who saw no examples before beginning to draw.

It is also interesting that, while attempting to examine what may have led groups to draw more or less conventional creatures, it was found that there was an effect of examples on the first three creatures drawn, but not on subsequent creatures. The first three drawings conformed more to examples, probably due to social influence. Over time, when group members became more comfortable with one another, they were able to break away from convention and create drawings with less fixated features.

In the future, we are interested in using different example sources to show participants. We would like to show participants creatures with less conventional common features and determine how that affects the level of fixation experienced by participants. We are also interested in investigating how groups chose their favorite drawings using the data set from this study. Because groups and individuals did not show the same effects when analyzing the number of fixated features in the drawings they chose as their best, it will be interesting to understand the various ways that groups and individuals decided upon which drawing to label their best.

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Transmission of Quantum Information via Laguerre Gaussian Modes

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Abstract

A new era of technology is fast approaching in which quantum computation may become a reality. In the near future, technical applications may require a method of correlating two isolated quantum systems. This would require a signal carrier to be a quantum entity itself. We survey the quantum states of photons as a medium for encoding information. A communication scheme using the modulation of spatial modes and polarization states on free space or fiber optics is proposed. The Laguerre-Gaussian spatial mode is studied with these applications in mind. We also study photographic slide film as a means of creating diffraction gratings. Holographic diffraction gratings were created in order to generate Laguerre-Gauss beam modes of varying quantum number n. The spatial mode phase characteristics were then studied with a Mach-Zehnder interferometer.

1 Introduction

Modern technology is entrenched in the use of bulk material properties as a medium of information processing. As we scale down to smaller and smaller devices, heat generated by electrical current and the granularity of matter limit the density of circuit elements. Researchers currently strive to overcome these limitations for the continued evolution of technology required by countless scientific, industrial and commercial applications. Since the current paradigm of information processing faces physical limitations, other computational schemes may be fruitful in attaining higher information density and processing speed. As we approach the scale of the atom, there is a new set of phenomena and physical properties that become available.

1.1 Quantum Computation

Modern computers almost exclusively make use of electrical voltages and magnetic states of materials to process and store information. There has been little need to develop other means of computation since this paradigm has offered a multitude of circuit elements from which technological devices are built. At the scale of modern nano-technology, the physics of atoms and their constituent particles govern the properties of materials. In this regime, we can no longer rely on the bulk electrical properties of materials as a means of information processing. We are now interested in assigning information to the quantum states of atoms and subatomic par- ticles.

To achieve this task, we must consider two aspects of quantum systems called coupling and coherence [1]. The coupling of a system describes how corresponds to how

strongly it reacts to external forces. For instance, a strongly coupled system is sensitive to the state of its environment, while a weakly coupled system is less reactive to its surroundings. The more coupled a system is to its surroundings, the easier it is to measure and manipulate. The coherence of a system corresponds to how long it can stay in a particular quantum state. A system that is weakly coupled with its environment is able to achieve coherence for a longer time. We may think of these concepts in terms of the time evolution of a given system. The dynamics of our system is governed by the Schrödinger equation:

$$i\hbar\frac{d}{dt}|\psi\rangle = H|\psi\rangle. \tag{1}$$

The state of the system is $|\psi\rangle$, a vector of Hilbert space, and H is the Hamiltonian of the system. The Hamiltonian can be split into terms that correspond to the coupling of the system to its environment. If we wish to describe an external input that controls the state of the system, we could write $H = H_{in}(t) + H_{env}$ where H_{env} describes the system's interaction with its environment. $H_{in}(t)$ describes coupling of the system to the instruments used to manipulate it into a desired state and is generally a function of time. Systems in which H_{env} is small and $H_{in}(t)$ can be modulated quickly are desirable for use in quantum computation.

Experimental research has developed systems which retain their quantum state for a sustained period and can be manipulated by external forces. These are typically in environments that are extremely cold to reduce thermal agitations from the surroundings, minimizing H_{env}. Quantum dots are an example of solid state systems that allow the manipulation of the spin state of single electrons in an ultracold environment. More elaborate experiments are able to excite electrons to higher energy levels and force them to emit single photons. Modern experimental research has achieved the required precision and control of atomic and solid state systems to be applicable to information storage and processing.

If we are ever to use these atomic systems as a medium of computation, there will undoubtedly be a need for some way of communicating information between two of them. It won't be a simple matter of hooking up a phone line between the two. Any communication scheme applicable to quantum information must use quantum entities as signal carriers.

1.2 Quantum Information

In modern computer technology, often called classical computation or classical computers, information is stored and transmitted in binary strings. Each element of a string of information takes on only two distinct values, to which computer scientists have arbitrarily assigned 0 and 1. We are used to seeing strings of binary code, e.g., 10100010, which we will write as a list:

$$1,\ 0,\ 1,\ 0,\ 0,\ 0,\ 1,\ 0.$$

This serves as the basis of all digital computer processing. With quantum computers, we are now interested in carrying out computations involving the *superposition* of quantum states.

Quantum information now has us thinking in terms of a different mathematical entity altogether. Instead of communicating information with digits, that is, binary 1's and 0's, we ascribe it to *kets*. In quantum mechanics, the state of the system $|\psi\rangle$ is a ket belonging to the set of all available states of the system. This set of kets spans Hilbert space, which is the set of all kets of finite norm. If a ket is not a member of Hilbert space, it can't represent a physical system. We often choose a basis in Hilbert space that is constructed from eigenkets in order to understand the state in terms of physical observ-

ables. We must pick a set of compatible observables to build an eigenbasis out of the tensor product of the subspaces that their eigenkets span. Consider an observable A and eigenspectrum $\mathbb{A}$. The eigenvalue problem reads

$$A|n\rangle = a_n|n\rangle,\ a_n \in \mathbb{A}.$$

If we choose the set of eigenkets $|n\rangle$ as an orthonormal basis in Hilbert space, then the expansion postulate states

$$|\psi\rangle = \sum_n c_n|n\rangle \tag{2}$$

for any $|\psi\rangle$ of finite norm [2].

We now consider a system which has two conjugate states available to it. It now has a two dimensional Hilbert space such that the state

$$|\psi\rangle = c_i|i\rangle + c_j|j\rangle$$

is a linear combination of two eigenkets to some observable. We attribute the binary 1's and 0's of classical information to these conjugate kets:

$$1, 0 \Rightarrow |1\rangle, |0\rangle.$$

Note that in this notation, the numbers 1 and 0 do not correspond to any quantum number and are introduced by hand to correspond with classical computation. The state of a binary quantum system is now written

$$|\psi\rangle \Rightarrow |\text{qubit}\rangle = c_0|0\rangle + c_1|1\rangle. \tag{3}$$

Now the system is said to be an element of information storage and transfer, and Equation (3) is called a binary quantum digit (qubit).

In quantum computation and communication, we encode information in strings of qubits instead of bits, which may be written as

$$a_0|0\rangle + a_1|1\rangle,\ b_0|0\rangle + b_1|1\rangle,\ c_0|0\rangle + c_1|1\rangle,\ \ldots$$

In this scheme, we are using qubits as a means of information transfer and processing.

Quantum computation and communication offer many advantages over classical computers because of its use of qubits. There are various new algorithms that use the qubit to solve problems that would take a classical computer an exponentially longer time to compute [1]. Quantum Cryptography makes use of the qubit to send ultra secure signals that can't be intercepted by a third party. The advantages of using quantum information give a great incentive to pursue physically realizable communication methods.

2 Theory

Light presents itself as a prime candidate for communicating quantum information. Photons could be used as quantum signal carriers because they're quantum particles and have a variety of states available to them. We look to the use of photons in quantum information transfer between two isolated quantum systems. We now develop a basis of states for which the spin and orbital angular momentum observables are compatible.

2.1 Angular Momentum Eigenstates

If we are to find a physical system that could represent a qubit, Equation (3) has us looking for quantum objects that possess an observable with at least two distinct eigenstates to which we can assign the logical 0 and 1. Either a single or multi-particle system could have this desired property. We focus our attention to the single particle case. The intrinsic spin of fundamental particles is a perfect candidate observable. The components of the spin operator $\mathbf{s}$ do not commute, so we can't build an eigenbasis involving more than one of them. In cartesian

coordinates, the spin operator is written

$$\mathbf{s} = s_1\mathbf{e}_1 + s_2\,\mathbf{e}_2 + s_3\mathbf{e}_3$$

where its components have the commutation relation

$$[s_i, s_j] = i\hbar\epsilon_{ijk}s_k \tag{4}$$

and ϵ_{ijk} is the Levi-Civita symbol [2]. With this commutation relation, it can be shown that $[\mathbf{s}^2, \mathbf{s}] = 0$, which means that the squared norm of the spin vector and any one of its components commute. If we form a common eigenbasis of $\mathbf{s}^2$ and one of its components s_i, we have

$$\begin{aligned} s_i|m\rangle &= m\hbar|m\rangle \\ \mathbf{s}^2|s\rangle &= s(s+1)\hbar^2|s\rangle \end{aligned} \tag{5}$$

and we may now write the state of a particle in the common basis $\{|m\rangle \otimes |s\rangle\}$ such that

$$|\psi\rangle = \sum_{m,s} c_{m,s}|m\rangle \otimes |s\rangle.$$

In the standard model of physics, the quantum number s in Equation (5) is empirically fixed at a single half integer value which depends on the particle being described. From Equation (4) it can be shown [2] that

$$m \in \{\, -s,\ -s+1,\ \ldots\ ,\ s-1,\ s\}. \tag{6}$$

This places a fundamental limit on the number of internal states available to a single particle. Nonetheless, any $s \neq 0$ would suffice in giving us two or more internal states in which to assign logical digits. One could imagine a communication scheme in which a stream of particles is sent between two locations while modulating the spin state in a chosen axis. Particles may acquire an orbital angular momentum (OAM) in addition to spin. The OAM operator $\boldsymbol{l}$ is a vector whose components have similar commutation relations to (4) which are written $[l_i, l_j] = i\hbar\epsilon_{ijk}l_k$. Proceeding in the same fashion, a common eigenbasis may be constructed for both $\boldsymbol{l}^2$ and one of the components l_i:

$$\begin{aligned} l_i|n\rangle &= n\hbar|n\rangle \\ \boldsymbol{l}^2|l\rangle &= l(l+1)\hbar^2|l\rangle \end{aligned} \tag{7}$$

where the basis would be $\{|n\rangle \otimes |l\rangle\}$. The total angular momentum of the system is then

$$\mathbf{j} = \boldsymbol{l} + \mathbf{s}.$$

We are interested in these additional quantized OAM states as a means of increasing the amount of logical states that could be assigned to an individual particle. The commutator algebra allows the quantum number l in (7) to be any half integer value, but we are limited to integer values because we require that our field to be single valued upon a rotation of 2π [2].

2.2 Communicating with Photon States

Digital communication with light has primarily relied on the classical aspects of radiation, such as amplitude and frequency. To be applicable to quantum information, we have to use the quantum mechanical aspects of the field. Photons are the quantized states of the electromagnetic field and are considered fundamental particles with a spin quantum number $s = 1$. According to (6), this allows for three distinct values of m. For a photon, a particle of zero rest mass, there is no eigenstate for $m = 0$ that is a solution to the field equations [2]. This leaves us with two spin states corresponding to $m = 1$ and $m = -1$ on an axis that is parallel with the propagation of the wave. For an integer spin field of zero rest mass, only the spin component in the direction of propagation $\boldsymbol{k}/k$ is compatible with the momentum operator $\mathbf{p} = \hbar\boldsymbol{k}$ [3]. Unlike other particles, the spin states of a photon have a correspondence to a classical aspect of light. The polarization of light can be understood in terms of these quantized spin states. If a wave is traveling

in a direction $\mathbf{e}_k = \boldsymbol{k}/k$, there are two independent spatial axes which are perpendicular to the wave vector $\boldsymbol{k}$. Let's consider a wave train of monochromatic light propagating in the $\mathbf{e}_k$ direction. We may write the electric field in terms of Cartesian coordinates, choosing the z-axis parallel with $\mathbf{e}_k$, as

$$\mathbf{E} = E_x e^{i(kz-\omega t+\delta)}\mathbf{e}_x + E_y e^{i(kz-\omega t+\phi)}\mathbf{e}_y$$

where δ and ϕ are phase angles of the two harmonic waves. Here, $\mathbf{e}_x$ and $\mathbf{e}_y$ form a basis of two rectilinear polarizations with respect to $\mathbf{k}$. If the difference between δ and ϕ is an integer multiple of π, then the wave is said to be plane polarized [4]. This means that the electric field vector oscillates back and forth in a plane of constant orientation. If this difference is not equal to an integer multiple of π, then the light is said to be elliptically polarized [4]. This state has the electric field rotating at each point in space as the wave propagates.

Linearly and elliptically polarized light can be understood in terms of eigenstates of spin. The spin quantum number m in (5) is limited to $\{1, -1\}$ for the spin component s_z. We may write a basis of circularly polarized states as a linear combination of the two linear polarizations [2]. With $\mathbf{e}_x \times \mathbf{e}_y = \mathbf{e}_k$ we write

$$\begin{aligned} \mathbf{e}_+ &= -\frac{\sqrt{2}}{2}(\mathbf{e}_x + i\mathbf{e}_y) \\ \mathbf{e}_- &= \frac{\sqrt{2}}{2}(\mathbf{e}_x - i\mathbf{e}_y). \end{aligned} \tag{8}$$

Photon states in the basis of $\mathbf{e}_+$ and $\mathbf{e}_-$ are eigenstates of the spin components parallel with $\boldsymbol{k}$ [2]. From (8) we can see that linear polarization is really a linear combination of circular polarizations. Manipulation of the spin state of light is easily achieved, and communication methods involving qubits encoded in the polarization of light have been demonstrated [5]. The two spin states present a perfect medium for assigning logical 0's and 1's. The total angular momentum may also be used in a similar way and may in fact be a more efficient means of communication. The infinite number of total angular momentum states places no limit on information density of each photon. But if we wish to assign quantum information to the OAM eigenstates and spin states simultaneously, we encounter a problem. One may always build eigenstates for the $\mathbf{j}$ operator, but in general, a particle of $s = 1$ can never be in a pure state with well defined spin and OAM quantum numbers m and n due to the spin orbit interaction [6]. An analagous procedure which resulted in (6) for the spin operator can be carried out for $\mathbf{j}$, resulting in quantum numbers $j \in \mathbb{N}$ and $i \in \{-j, -j+1, \ldots, j-1, j\}$ [6]. If we are to use the spin states and OAM states simultaneously, we must resort to the paraxial approximation.

2.3 The Laguerre-Gaussian Spatial Mode

Paraxial optics is primarily used to describe the dynamics of coherent light beams, such as that produced by laser diodes. If an electromagnetic wave is propagating in a non-dispersive, isotropic, linear, and homogeneous medium, all field components may be described by a single scalar function $u(\mathbf{r}, t)$ that contains all the information of the field [7]. We can write the vector potential in terms of this scalar function

$$\mathbf{A}(\mathbf{r}, t) = A_0 u(\mathbf{r}, t)\mathbf{n}$$

where $\mathbf{n}$ is a linear combination of the vectors in (8). The electric and magnetic fields are then expressed as $\mathbf{E} = \frac{-1}{c}\frac{\partial \mathbf{A}}{\partial t}$ and $\mathbf{B} = \nabla \times \mathbf{A}$ [6]. To solve for $u(\mathbf{r}, t)$ we use separation of variables between $\mathbf{r}$ and t so that $u(\mathbf{r}, t) = u(\mathbf{r})e^{-ikct}$ and make the paraxial approximation to the Helmholtz equation along the z direction in cartesian coordinates:

$$\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} - 2ik\frac{\partial}{\partial z}\right) u(\mathbf{r}) = 0. \tag{9}$$

A complete basis of solutions to (9) are the Laguerre-Gauss (LG) modes. They are written in cylindrical coordinates (r, θ, z) as

$$\begin{aligned} u_{np} = \frac{e^{in\theta}}{w}\sqrt{\frac{2p!}{\pi(p+|n|)}}\left(\frac{\sqrt{2}r}{w}\right)^{|n|} \\ \times L_p^{|n|}\left(\frac{2r^2}{w^2}\right)\cdot\exp\left(-\left(\frac{r}{w}\right)^2 - \frac{ikr^2 z}{2(z^2+z_R^2)}\right) \\ \times\exp\left(i2p + i(|n|+1)\arctan\frac{z}{z_R}\right) \end{aligned} \tag{10}$$

with $r = \sqrt{x^2+y^2}$ and $\theta = \arctan(\frac{y}{x})$, $w = \sqrt{1+z^2/z_R^2}$ is the beam radius, $2z_R$ is the Rayleigh range of the beam, and $L_p^{|n|}(\ldots)$ are the associated Laguerre polynomials with $p \in \mathbb{N}$ and $n \in \mathbb{Z}$ [6]. A photon that is in the state with a scalar field amplitude described by (10) can be interpreted as being in an eigenstate of the z-axis orbital angular momentum operator l_z. In cylindrical coordinates this is written as

$$l_z = \frac{\hbar}{i}\frac{\partial}{\partial\theta}.$$

We will rewrite (10) as

$$u_{np}(r,\theta,z) = f_{np}(r,z)e^{in\theta}$$

and it is obvious that

$$\begin{aligned} l_z u_{np}(r,\theta,z) &= \frac{\hbar}{i} f_{np}(r,z)\frac{\partial}{\partial\theta}e^{in\theta} \\ &= n\hbar\, u_{np}(r,\theta,z). \end{aligned} \tag{11}$$

The vector potential can finally be written as

$$\mathbf{A}(\mathbf{r},t) = A_0\sum_{np} c_{np}\, f_{np}(r,z)e^{-ikct+in\theta}\mathbf{n}_{np}$$

where $\sum_{np}|c_{np}|^2 = 1$.

In the formalism of quantum mechanics, we can rewrite the eigenvalue problem (11) in terms of kets where $u_{np} \Rightarrow |n,p\rangle$, and we write

$$l_z|n,p\rangle = n\hbar\,|n,p\rangle.$$

These eigenstates are normalized with the condition [6]

$$\begin{aligned} \langle n,p\,|\,n',p'\rangle &= \iint_{\mathbb{R}^2} u^*_{np}(x,y,z)u_{n'p'}(x,y,z)\,dx\,dy \\ &= \delta_{nn'}\delta_{pp'} \end{aligned}$$

and an observable A is represented in this basis as

$$\langle n,p\,|\,A\,|\,n',p'\rangle = A_{nn'pp'}.$$

We can now write a photon state $|\gamma\rangle$ in the paraxial approximation as

$$|\gamma\rangle = \sum_{n=-\infty}^{n=\infty}\sum_{p=0}^{p=\infty} c_{np}|n,p\rangle \tag{12}$$

which follows from the expansion postulate (2).

We now consider the spin operator acting on the LG modes. Because the eigenstates of the spin operator are the circular polarizations, the extension of our description of $|\gamma\rangle$ to include spin states is made easy by the fact that we separated the polarization and spatial characteristics of the beam when carrying out the paraxial approximation. Without the paraxial approximation, we wouldn't be able to write a common eigenbasis of spin and OAM because of the spin orbit coupling inherent to zero rest mass fields. The spin acts on the polarization vector $\mathbf{n}_{np} = (c_+\mathbf{e}_+) + (c_-\mathbf{e}_-)$ where $|c_+|^2 + |c_-|^2$. If we rewrite (8) as $\mathbf{e}_- \Rightarrow |-1\rangle$ and $\mathbf{e}_+ \Rightarrow |+1\rangle$, we can write our state in a common basis of spin and OAM

$$|\gamma\rangle = \sum_{m=-1,1}\sum_{n=-\infty}^{n=\infty}\sum_{p=0}^{p=\infty} c_{npm}|n,p\rangle\otimes|m\rangle. \tag{13}$$

This serves as the basis for a potential communication scheme in which quantum bits are assigned to the spin states, and additional information is assigned to the OAM quantum number and associated radial number p.

3 Experimental Methods

Optical vortices are a feature of the LG modes, and their properties have been intensely studied in the field of singular optics. We turn our attention to the spatial characteristics of these intriguing swirls of light. The LG modes have interesting phase characteristics that are best observed as a level set of the scalar field wavefronts plotted in 3 dimensions. The phase is singular along the axis of the beam at $r = 0$. Far from the central beam axis, the scalar field approaches a plane wave; but with each wavefront out of phase by π at diametrically opposing points of the paraxial plane. This gives a strange corkscrew pattern to the scalar field, shown in Figure 1.

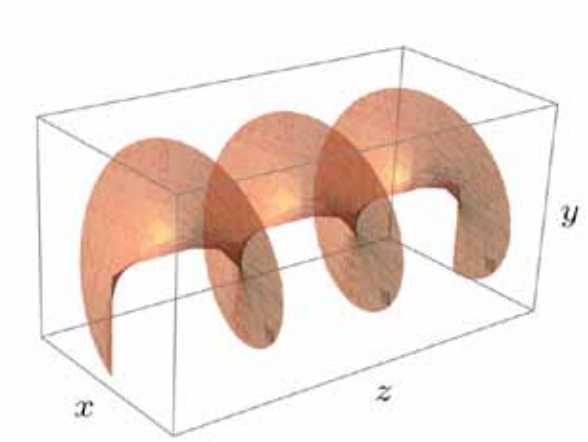

Figure 1: A level set of the scalar field phase for a u_{1p} mode. The plane represents a surface of similar phase, i.e., wavefronts. Notice the line of singular phase down the center of the beam. The presence of the singularity means that the field amplitude must approach zero along the axis of the beam.

When incident on a surface, the paraxial (plane perpendicular to propagation) intensity profile has a central area of zero intensity, giving it a doughnut like shape. Figure 2 shows a series of intensity profiles for various n. In order to better understand how LG modes are created and how they could apply to quantum information, we set out to make our own vortices in the lab.

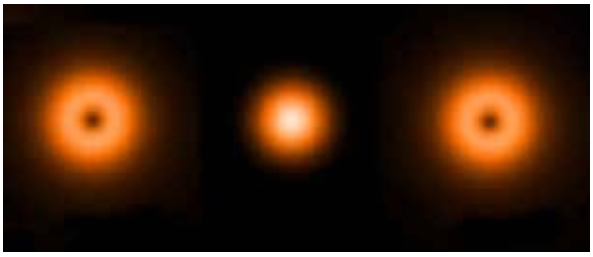

Figure 2: A plot of the intensity profile for an $n = -1, 0, 1$ from left to right. The $n = 0$ mode reduces to a Gaussian beam. The central hole in the others coincides with the axis of singular phase of the LG mode.

3.1 Computer Generated Holograms

We can experiment with LG modes by creating them via computer generated holograms (CGH). Scalar diffraction theory describes the field amplitude of light that is scattered by one of these diffraction gratings. Figure 3 shows an example of a CGH pattern that would produce our LG modes if laser light were to shine through its center. To make this, a density plot of the theoretical interferogram of an LG beam of OAM quantum number n and a Gaussian beam is calculated with the function [8]

$$I(x, y) = \frac{1}{2}\left[1 + \cos(2\pi x - n \arctan(y/x))\right].$$

The optical density would ideally be 100% where $I(x, y) = 1$, and 0% where $I(x, y) = 0$. We wish to put this pattern on a surface for which the black lines are optically dense and the white lines transparent to light. The light that passes through the transparent portion is diffracted and forms a holographic pattern. Figure 4 shows a diagram of this principle.

There are several techniques for transferring this pattern to a transparent medium. One could print it out on transparency film using a laser printer. A spatial light modulator could also be employed to create the density patterns. These two methods

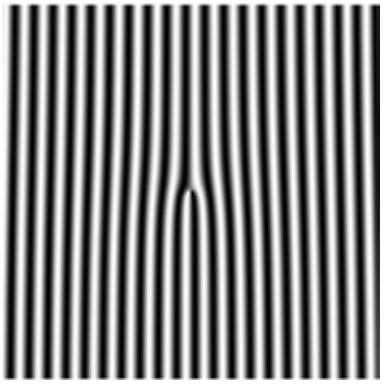

Figure 3: The computer generated hologram features a forked pattern with 1 dislocation made from the function $I(x,y) = \frac{1}{2}\left[1 + \cos(2\pi x - \arctan(y/x))\right]$. The pattern far from the origin looks like the line pattern $\frac{1}{2}(1 - \cos(2\pi x))$.

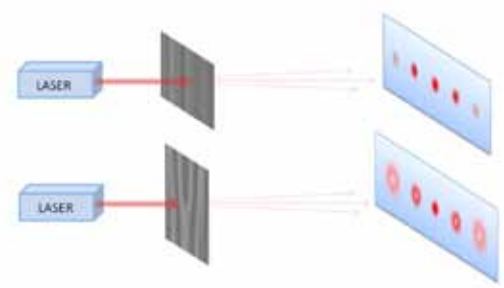

Figure 4: (Top) The familiar diffraction experiment. The diffracted patterns have no imprinted phase. (Bottom) A laser emitting a TEM_{00} shines down the center of the fork pattern. A diffraction pattern is seen on the other side with a Gaussian central mode and higher order LG modes that have the $e^{in\theta}$ imprinted in them. The order of the principal maxima coincides with the quantum number n. So, for example, an LG mode that is the second principal maximum of the pattern will have $n = 2$.

have a huge disadvantage in the resolution of the pattern that they can recreate. The resolution of a laser printer, typically 600dpi, makes it difficult to reproduce the CGH pattern without introducing aliasing. A spatial light modulator would face the same fundamental problem. Photographic film is a much more cost effective option and has a lot of flexibility. Photographic film negatives have been used before to create relatively high quality CGH's in an undergraduate laboratory [8]. We aimed to reproduce these results using photographic slide film instead. Figure 3 shows the part of the holographic pattern that was photographed. An SLR camera was loaded with Fujichrome Velvia 50, a daylight color reversal slide film with an ISO speed rating of 50. The fidelity of the pattern is limited only by the grain size of the exposure. The actual size of the grains of photographic film depends on the exposure time. This film has a diffuse RMS granularity value of 9, as measured by a standard micro-densitometer. A relatively low value for this rating means that a quick exposure will have small grain size. The graininess shows up as tiny speckles of higher optical density. If a pattern is too fine, then the film grain will drown it out.

To transfer the CGH pattern to our Fujichrome, we generated a large format, 100 MP digital density plot effectively 200 lines across using mathcad software. This pattern was printed with a 600dpi large format printer. The printout was then spray mounted to a flat surface, leveled, and photographed from a distance with the SLR camera. The shots were taken outside on a sunny day so that the pattern was illuminated by natural daylight. A large pattern with tight line spacing was needed because of the wide range of sizes the pattern would be on the film. If the pattern were too small, the far field of the incident laser mode would be cut off by the square edges of the pattern. A variety of focal lengths and exposure times was used for each frame. The slides that were studied in this investigation had exposure times ranging from 1ms to 2ms.

3.2 Creation of Laguerre-Gauss Beams

Out of the 36 exposures that were taken, a few were selected that exhibited appropriate contrast and line spacing. To measure the patterns created by the slides, a Hitachi HV-F31F 3 CCD color cam-

era was used. The CCD surface area is 4.77mm (horizontal) × 3.58mm (vertical) with a pixel spacing of 4.65µm per pixel. These specifications were used to measure the dimensions of the patterns that resulted from the slides. The laser that will make the pattern should be as close to the TEM_{00} mode as possible. We selected a Uniphase Model 1677 laser head that emits TEM_{00} with a mode purity of >95% to generate the diffraction patterns. The wavelength of the light was 594nm and had a beam diameter of 0.73mm. To capture a paraxial intensity pattern in the limit of Fraunhofer diffraction, the CCD was placed on a translation mount sufficiently far along the optical path length of the pattern that the principal maxima were well defined. The translation mount was set up to move the camera horizontally along the x-axis of the paraxial plane. The pattern was too wide to be captured in a single frame, so multiple images had to be overlayed. Each order captured was centered in the frame, and a total of four images were taken. They were compiled together with the GIMP using distance measurements from the translation mount. Figures 5 and 6 shows the compiled image.

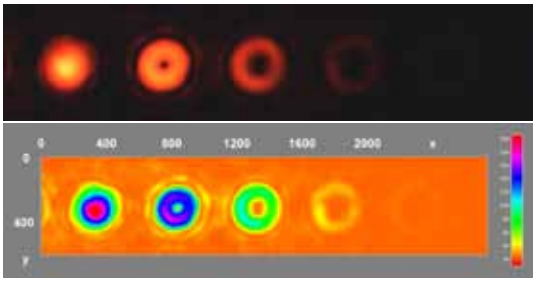

Figure 5: (Top) The resulting holographic pattern captured by panning the camera with a translation mount for the $D = 99.0$µm slide. (Bottom) The relative intensity of the captured image color altered for clarity. The legend on the right corresponds to the intensity relative to a saturation value of 255. The horizontal and vertical axes represent the (x, y) coordinates of the paraxial plane measured in pixels (4.65µm/pixel). The pattern is symmetrical about the axis of the central TEM_{00}, so only half the pattern was captured. From left to right are LG modes with quantum number $n = 0, 1, 2, 3, 4$. Distinct rings are visible around the central doughnut pattern of each mode. These are attributed to the number p, which characterizes the radial part of the u_{np} modes.

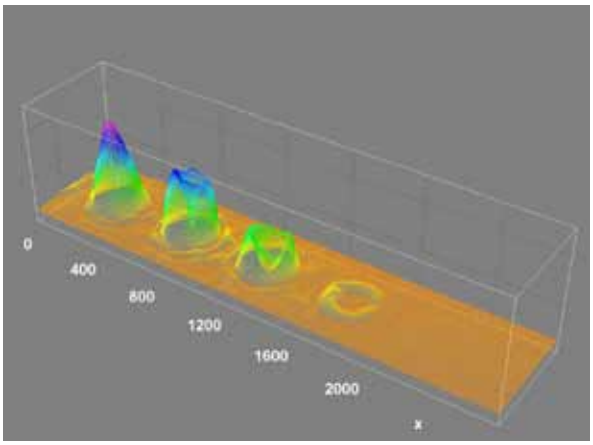

Figure 6: A 3 dimensional plot of the intensity for the $D = 99.0$µm slide. The color and height correspond to the relative intensity, and the displayed units are the same as in Figure 5.

A series of neutral density filters were used to attenuate the light to the range of sensitivity of the CCD. If the light was too bright, the higher intensity portions of the pattern would be cut off at the maximum relative intensity value of 255. To measure the dimensions of the holographic patterns, image analysis software was used to find the number of pixels between each principal maximum. To interpolate the center of the modes, a Gaussian blur filter was applied to the image shown in Figure 5 (Top) in order to smooth out maxima introduced by noise and film grain. This proved to be an effective method for finding the central axis of the LG modes and gave consistent maximal points for blur radii of 10 pixels and greater. When comparing the holographic patterns captured at different points along the optical path length, the angle between the central axis and principal maxima can be determined. Figure 7 compares the intensity of two such measurements. Using the formula

$$D \sin \theta_n = n\lambda$$

where D is peak to peak line spacing of the pattern on the slide, θ_n is the angle between the central axis and n^{th} principal maxima, and λ is the wavelength, the line spacing can be calculated from

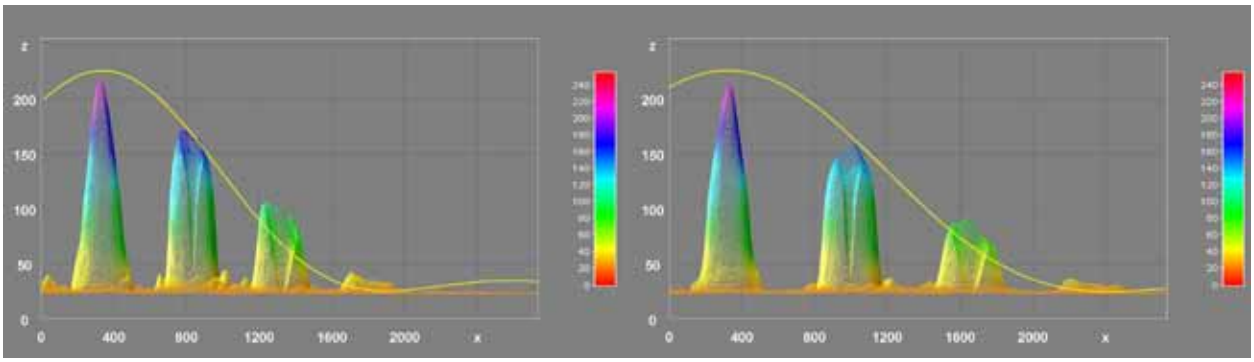

Figure 7: (Left) The intensity of the pattern plotted horizontally for the $D = 99.0\mu$m slide. The pattern was captured 38.9cm from the slide. (Right) The same plot for an image captured 51.6cm from the slide. Overlaid on both plots is the single slit irradiance calculated by the Fraunhofer integral evaluated with experimental measurements. The principal maxima of the diffraction pattern qualitatively follow this intensity profile.

the maxima spacing [4]. Using this technique, the slide that created the holographic pattern in Figure 5 was measured to have a line spacing of $D = 99.0\mu$m. Figure 8 features a holographic pattern that was created with a slide that had a higher line density. This slide was measured to have a line spacing of 39.9μm. The only modes visible for the $D = 39.9\mu$m were the first principal maxima.

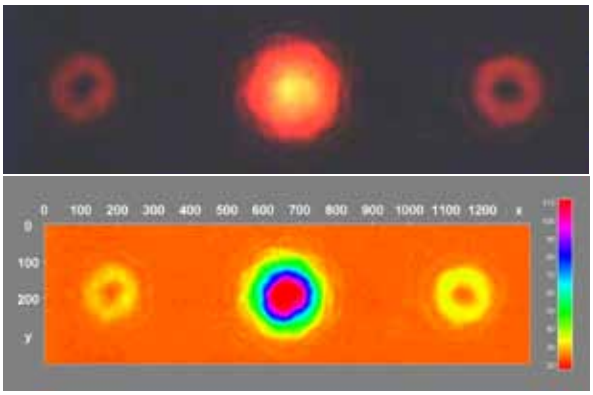

Figure 8: (Top) The diffraction pattern for the $D = 39.9\mu$m. The contrast has been altered to make the LG modes more visible. (Bottom) The original captures recolored. The only maxima visible correspond to $n = -1, 0, 1$ from left to right.

Compare Figure 8 with Figure 2 and you will notice that the experimental measurements have an extra ring around the central doughnut pattern. They are even more apparent in Figure 5. These are attributed to the radial number p in (10). The Laguerre polynomial determines how many radial rings there will be. The principal maxima of the holographic patterns are really linear combination of LG modes with different radial number p. We can interpret this in terms of (12) as an eigenstate of l_z expanded in states of differing radial number:

$$|n^{\text{th}} \text{ maxima}\rangle = \sum_{p=0}^{p=\infty} c_p |n, p\rangle.$$

The maxima of the slides, though not pure LG modes, have well defined quantum number n because of the degeneracy in p. We can write any eigenstate of l_z in this way.

3.3 The Mach-Zehnder Interferometer

In order to measure some of the characteristics of our LG modes, a Mach-Zehnder Interferometer (MZI) was constructed. Figure 9 shows our setup. The MZI consists of two cubic beam splitters and two mirrors arranged such that an incident beam is split 50:50. These two beams are then reflected by the mirrors into the second beam splitter where they intersect perpendicularly at the reflective interface. The dielectric coating at the interface of a beam splitter is situated so that one of the beams picks up a phase factor of π upon reflec-

tion while the opposing beam doesn't. This makes the transmitted and reflected beams at one output destructively interfere and at the opposite output constructively interfere. An MZI can be used as a means of measuring the quantum number n for an incident LG mode [9] as well as a variety of other interesting applications involving LG modes [10]. Figure 10 shows the LG mode measurement scheme devised in [9]. These applications consist of manipulating the state of the beam on either or both arms of the MZI and interfering them at the output. An example of this was carried out with our experimental setup. To see the mode purity of the first principal maximum for one of our slides, we captured the interferogram of the maxima and reference beam. This was achieved by inserting the hologram into one arm of the MZI and leaving the other unaltered. The interferance pattern that was captured is seen in Figure 11. The primary pattern is clearly visible as a discrete number of interference fringe dislocations at the top and bottom region of the pattern. If this procedure were carried out with the second principal maximum, we would observe two dislocations. In general the n^{th} maximum will produce n dislocations in the interferogram.

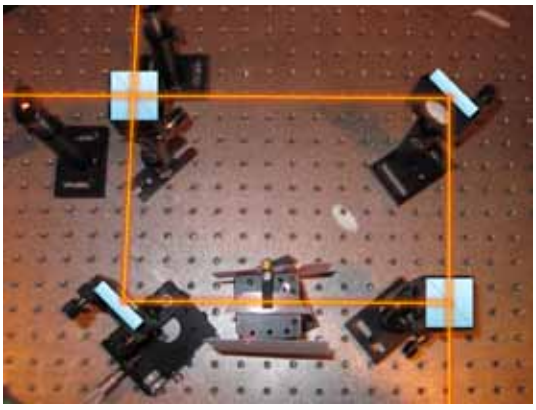

Figure 9: A snapshot of the MZI used in our experiment taken from above. The overlay demonstrates the symbolic representation of the beam splitters and mirrors. The beam splitters are the square boxes with a diagonal slash, and the mirrors are the rectangular boxes. A dove prism can be seen on one arm of the interferometer. Using two dove prisms, we could reproduce the sorting scheme carried out in [9].

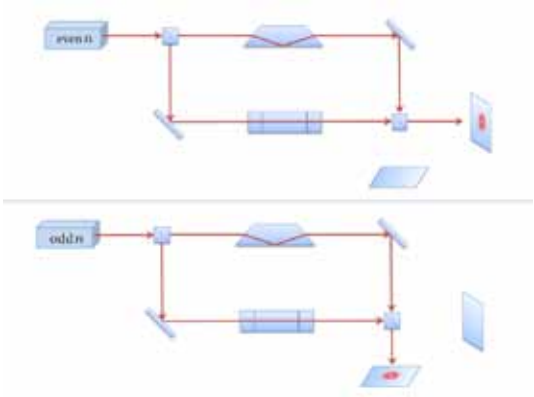

Figure 10: An MZI set up with dove prisms rotated by $\pi/2$ with respect to each other. The light coming in the MZI is interfered and LG modes with odd and even n exit the beam splitter perpendicularly provided that each arm has the exact same optical path length.

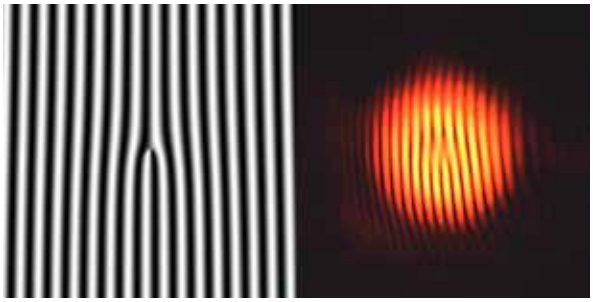

Figure 11: (Left) The theoretical interferogram of an LG mode of $n = 1$, and a plane wave. (Right) The interferogram of the first principal maximum of the $D = 99.0\mu$m holographic pattern interfered with a reference TEM_{00}. The radial distortion is due to the optical path length differences in each arm of the MZI imposed by using a diffraction grating. In addition to that, the beams have a different radius of curvature at the second beam splitter. These circumstances make it difficult to determine how much of the radial interference is attributable to the radial number p of the maximum being measured.

4 Discussion

To understand the manipulation of light in terms of quantum mechanics, we can think of the beam's interaction with optical elements in the context of paraxial evolution. If we rewrite the paraxial ap-

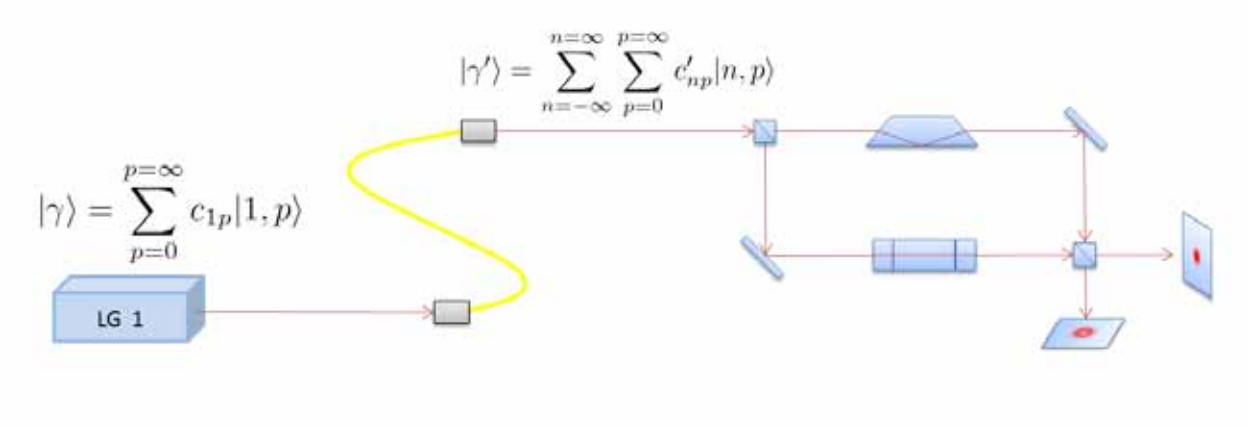

Figure 12: Fiber Distortion. This schematic represents how we can understand the paraxial evolution of the beam in terms of the eigenbasis we have constructed in (12). A prepared LG 1 mode is coupled to a fiber optic channel. The fiber distorts the output beam which can be seen as a transformation $|\gamma'\rangle = F|\gamma\rangle$.

proximation (9) as

$$\frac{1}{2k}\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)u(\mathbf{r}) = i\frac{\partial}{\partial z}u(\mathbf{r}), \qquad (14)$$

there is an apparent parallel with the temporal evolution of a quantum system governed by (1). The way that (14) is written may remind the reader of the wave mechanics for matter waves. While it is true that we associate the intensity of light with the probability of a photon arriving at a certain point in space, it is important to note the distinction between the scalar field amplitude and a position representation wavefunction. It is impossible to write a position vector operator that acts on the state space of photons and has components that commute [11][3]. This means we can only describe the probability of a photon arriving at a region of space in terms of the complex field amplitude. This seems counterintuitive at first, but it should make sense if one thinks of a photon as an excitation in a quantized field instead of a point particle. The intensity can then be thought of as the probability of the field quanta, i.e., photon, to interact with matter in a region of space [12]. If we wish to have a communication scheme with single photons, the intensity of the light must be sufficiently low to ensure that one photon at a time is traversing the optical path. We can then use (14) to describe the evolution of the photon state along the optical path. We can think of the coordinate along the axis of propagation in the regime of paraxial optics as an analog to the temporal parameter. The same ideas of coherence and coupling mentioned above could be applied to the paraxial evolution of a light beam. Coherence in this case would correspond to how far along the optical path length a photon would stay in a particular state. If we wish to guide the beam using an optical waveguide, it would undoubtedly distort the mode purity of an LG mode. Figure 12 shows this principle. Optical elements that produce as little distortion as possible are desirable for communication.

This study of the LG modes at Grand Valley State University has paved the way for many interesting opportunities for future undergraduate research. Future work will involve further investigation of the use of slide film in diffractive optics experiments. A study of the effect on fiber optics on LG mode purity could potentially be carried out. Future theoretical research would entail a more detailed analysis of the relationship between photon OAM and spin to determine the validity of (13).

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Developing Evolutionary–Based Domain–Specific Loyalty Scales

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Abstract

Loyalty has been researched in many areas, but little attention has been paid to whether loyalty is a unitary construct or differs across domains. We suggest that loyalty will differ across domains in accordance with the challenges our ancestors faced during their evolutionary history. We test this hypothesis by developing seven psychometric loyalty scales—each putatively assessing a different domain—and investigating whether there is significant individual variation across them. The proposed domains are loyalty to group, friend, romantic partner, kin, nation, sports team and brand. We found good internal consistency for all seven scales, and factor analysis indicated that the scales were distinct, supporting the hypothesis of distinct loyalty domains. We also found preliminary evidence for gender differences in two of the domains. This research illustrates the utility of an evolutionary perspective and should help future studies identify the contextual and dispositional factors contributing to loyalty.

Introduction

The tradition in personality psychology has been to focus on measuring individual variation in traits such as extraversion or risk-taking, assuming the person who is extraverted or risk-prone in one situation will be extraverted and risk-prone in all other ones (Kruger, Wang, & Wilke, 2007; Church, 1987). Nonetheless, there is emerging evidence that the expression of apparent personality traits can differ according to the situation or domain. For example, in the area of risk-taking, it has been found that the same person who will have unprotected sex with a stranger might be completely unwilling to bet $10 at the horse track or ride a bike without a helmet (Kruger, Wang, & Wilke, 2007). Thus, it seems that the expression of personality traits can differ according to the situation or domain.

In this context, one trait of great interest is loyalty. Loyalty, generally defined as showing allegiance to a person or entity, is of great interest because it lies at the heart of many apparently altruistic behaviors and because it has received substantial scientific attention. For example, researchers have investigated what contexts accentuate or extinguish loyalty and how loyalty to particular entities (e.g., sports teams, brands, service providers, groups) develops (Bauer, Stokburger-Sauer, & Exler, 2008; Winfree, McCluskey, Mittelhammer, & Fort, 2004; Devin & Mackie, 2009; Drigotas, Whitney, & Rusbult, 1995; Moreland & McMinn, 1999; Baxter, et. al., 1997).

More recently, investigators have considered the extent to which an individual's loyalty remains stable across time and situations, i.e., is trait-like. In particular, Beer and Watson (2009) developed two self-report scales to measure individual loyalty (e.g., "I stand by my friends") and group loyalty (e.g., "I am loyal to my country"). They showed that these scales are internally consistent, stable over time, and show strong self-peer agreement. Most relevant for the present discussion, they

showed that individual loyalty and group loyalty were only modestly correlated, suggesting that although loyalty is trait-like, it is domain-specific, not general.

If the tendency to show loyalty is indeed a stable trait that varies across domains (e.g., some are loyal to their country but not to their friends; other people show the opposite pattern), then scientists should consider why this is the case. We propose that progress in answering this question can be made by taking an evolutionary psychological perspective. (For a similar approach to domain-specificity of risk-taking, see Kruger, Wang, & Wilke, 2007.) Although their results are fully compatible with an evolutionary perspective, Beer and Watson (2009) were apparently not motivated by this perspective because it is not mentioned in their paper.

Evolutionary psychology stresses that the human mind is not a general-purpose problem solver or computer but instead largely consists of numerous adaptations for solving specific problems that recurred during human evolutionary history (e.g., avoiding toxic plants; identifying a suitable mate) (e.g., Cosmides & Tooby, 1994; Hagen, 2001). For instance, quick perception of the movement of a snake could have meant the difference between life and death throughout much of our history. The problem arises with modern moving objects like cars. A general-purpose approach would indicate that movement detection is the same, regardless if it is a snake or a car that moved. Conversely, a recent study on change blindness, which is the inability to detect change in the position of objects from one viewing to another, has shown that individuals typically had less change blindness when the change was an animal than if it was a motor vehicle (New, Cosmides, & Tooby, 2007). Thus the detection of change in animals is a specific adaptation due to a specific problem.

From an evolutionary perspective, loyalty in a particular domain or context is a psychological state that, during human evolutionary history, generally entailed costs and benefits specific to that domain. For example, the benefits of showing loyalty to one's group would include reducing the group's likelihood of being exterminated by other groups and gaining status from promoting the group's ideology, whereas costs might include increasing the risk of dying in warfare and diminishing the access to the goods and knowledge of rival groups (Van Vugt & Hart, 2004). By contrast, showing loyalty to a spouse would be beneficial if it increased the stability of a marriage and the well-being of children, whereas the costs might include the possibility of being cuckolded or overlooking a higher-quality potential mate.

Assuming that the selective forces that favored loyalty differ according to the domain, then the underlying psychology for processing information in each domain is expected to be distinct. If so, then research into the multi-faceted nature of loyalty (e.g., Beer & Watson, 2009) might best proceed by considering the loyalty domains that would have been relevant during human evolutionary history. The examples noted above—loyalty to a group and to a spouse—are evolutionary-relevant because, for the past several thousand years, our human ancestors have lived in large groups that include numerous long-term male-female partnerships (i.e., marriage) (Buss, 2004). By contrast, brand loyalty would not have been evolutionarily relevant, and thus it is not expected to be based on distinctive psychological mechanisms; instead, it is likely based on other forms of loyalty.

Using an evolutionary perspective, we hypothesize that loyalty can be broken down into different domains (friend, kin, romantic partner, and group), each of which would have been crucial during most of human evolutionary history. We also hypothesize that these domains will be distinct from each other, in that an individual who demonstrates high loyalty in one domain will not necessarily demonstrate high loyalty in another domain. In addition, we hypothesize that modern forms of loyalty (national loyalty, sports fan loyalty and consumer loyalty) will be based on or be byproducts of those four types of loyalty that developed during our human evolutionary history. For example, we predict that people who show high "sports team" loyalty should be the same people who show high "group" loyalty.

To test these hypotheses, we developed a series of loyalty scales, each designed to assess a distinctive and evolutionary-relevant domain. A previous study suggests that individual and group loyalty are domain-specific because individuals who reported high loyalty in one area did not necessarily report high in other, i.e., the correlation between the two self-report questionnaire loyalty scales was only modest (Beer & Watson, 2009). To test this prediction further, we will gather data on these domains using the previously developed scales (labeled "friend loyalty" and "group loyalty"). In addition to those two domains, we will test two other evolutionarily-relevant domains, each designed to assess a distinctive loyalty domain originating during the human environment of evolutionary adaptiveness (EEA). We will also test three additional domains, each designed to measure a domain of loyalty that is evolutionarily novel but which may tap into or be based upon the evolutionarily-relevant domains. Thus, we are testing for seven different domains of loyalty.

The first four domains that we will attempt to measure are loyalty to friend(s), kin, romantic partner(s), and group(s). Friend loyalty is loyalty to an individual friend. Allies would be valuable in many contexts, especially within one's group (Buss & Hawley, in press). Kin loyalty is loyalty to relatives, usually blood relatives, but adopted relatives are included, due to the fact that most "adoptions" that occurred during our evolutionary history were done by genetic relatives (Silk, 1980). Inclusive fitness theory holds that individuals may evolve predispositions to direct prosocial behavior towards genetic relatives (Hamilton, 1964). Romantic partner loyalty is loyalty to a spouse or long-term romantic partner. Long-term romantic partnerships (e.g., marriage) occur in virtually all human societies and presumably have long been part of our evolutionary history (Buss, 2004). Group loyalty is loyalty to one's group or organization. During the human EEA, humans usually lived in groups of 40–150 that were frequently in competition (Foley, 1995; Zdaniuk & Levine, 2001).

The three novel domains of loyalty that we will attempt to measure are loyalty to nation(s), sports team(s) or consumer brand(s). National loyalty is the modern loyalty that may show the closest relation to an EEA loyalty, based on the idea

that modern nations may have evolved from tribal groups. Although sports team loyalty makes no sense from a rational economic perspective, many individuals strongly identify with sports teams that neither they nor their friends or kin have direct connections with (Winegard & Deaner, 2010; Heere & Jamses, 2007). Consumer loyalty has received much attention, but its evolutionary origins have not been explored (Funk & James, 2006; Jones, Taylor, & Bansal, 2008).

Another important goal is to explore if there are demographic factors that correlate with or confound particular domains of loyalty. This is important because it demonstrates the divergent selective pressures that different demographics have faced throughout the human EEA. For instance, some recent work on "male warrior" psychology (Van Vugt & Hart, 2004) suggests that males might show greater sports fan loyalty and group loyalty. On the other hand, women may show higher friend loyalty (cf. Buss and Hawley, in press).

Methods

Each hypothesized loyalty domain was assessed using 11-18 self-report items (e.g., "I would not betray my romantic partner's trust") (see Appendix A). Eighteen items were exact items from existing scales (Beer & Watson, 2009; Haidt & Graham, 2007), 55 items were adapted from existing scales (Beer & Watson, 2009), and we created 17 items. The items that were adapted from existing scales were items that were previously used for a different scale but were changed to fit the new scale (e.g., "I would not betray a friend's trust" was changed to "I would not betray my romantic partner's trust"). The items that were created were designed to fill holes or address issues that had not previously been examined in loyalty research (e.g., "If someone that I felt a connection to other than my romantic partner indicated they were in love with me, I would return the emotions"). Nine demographic related questions were included. Eight of the demographic items were presented at the beginning of the survey (age, gender, race, sexual orientation, relationship status, relation to family, attitude towards family, and attitude towards friends), whereas the final demographic item ("I consider myself a loyal person") was presented at the end of the survey. There were a total of 98 items in the study.

Participants were given the option to skip three of the scales (group, sports team, and consumer loyalty) after answering the first question of that scale. For the group loyalty scale, participants were instructed to skip the section if they were not part of a team or other group (e.g., athletic, religious, political, service, hobby, organization, etc.). For the sports team loyalty scale, participants were instructed to skip the section if they were not sports fans. For the consumer scale, participants were instructed to skip the section if they did not have a favorite consumer product or brand. The skip options were included to allow participants to indicate that for them there was no relevant group, sports team, or consumer brand.

Participants were obtained through the Internet website socialpsychology.org. Surveys were completed online on the site Surveymonkey.com using their basic survey software. Unfinished surveys were removed; 137 finished surveys were obtained (85 female, 52 male). Ages ranged from 18 to 71 (M=33). There was no incentive for participation. Participants responded on a 7-point Likert scale (1: Strongly Disagree; 7: Strongly Agree) for 89 items, Yes/No for 3 items, and categorically for 6 demographic items.

Upon completion of the study, the internal consistency of the items within each putative domain was assessed using Cronbach's Alpha. Factor analysis was then run to test if the different domains loaded on different factors, as predicted. Factor analysis is a statistical measure that describes variability among variables through a lower number of underlying variables, or factors. The items for each scale were summed, by participant, and then correlations between the scales were calculated. In addition, paired t-tests were run to determine if demographic differences were present. Factor analysis, correlations, and the paired t-tests were calculated using SAS software.

Results

Internal consistency (Cronbach's Alpha) for the scales ranged from 0.88 for sports team loyalty to 0.96 for country loyalty (see Table 1). All ratings are considered acceptable for reliable measures.

Scale	Cronbach's Alpha
Friend	0.90
Romantic Partner	0.89
Kin	0.94
Group	0.95
Sports Team	0.88
Country	0.96
Consumer	0.91

Table 1. Internal Consistency of Loyalty Domains

Rotated factor analysis of the 98 items showed 7 primary factors (eigenvalues: 11.2, 10.9, 10.0, 8.8, 8.2, 7.9 and 6.7) with a large drop off to factor 8 (eigenvalue: 2.0). Each scale loaded on its own factor (see Table 2). Sports team loyalty loaded highest on the first factor (median loading: 0.96). Group loyalty loaded highest on the second factor (median loading: 0.98). Romantic partner loyalty loaded highest on the third factor (median loading: 0.75). Kin loyalty loaded highest on the fourth factor (median loading: 0.79). Country loyalty loaded highest on the fifth factor (median loading: 0.82). Consumer loyalty loaded highest on the sixth factor (median loading: 0.86). Finally, friend loyalty loaded highest on the seventh factor (median loading: 0.68). (See Appendix B for full factor loadings.)

To examine the putative independence of the domains, we summed the items for each domain and then computed correlations among each of the domains' sums (see Table 3). The key finding, consistent with the factor analysis, was that the correlations are generally modest, with the strongest correlation being 0.67.

Three gender differences were found (see Table 4). Women reported greater friend loyalty, t(91)= 2.14, p= 0.03; their responses were significantly higher for six items. While women did not report greater general romantic partner loyalty, they did report higher romantic partner loyalty in two specific areas. They reported greater romantic partner loyalty for the single question involving general personal opinion of loyalty, rather than loyalty actions (e.g., "I am loyal to my romantic partner" rather than "I am always ready to come to the aid of my romantic partner"), t(63)= 2.63, p= 0.001. Women also reported greater romantic partner loyalty for items specifying infidelity, t(81)= 2.97, p= 0.01; their responses were significantly higher on 5 items. Men did not report significantly greater sports fan loyalty, t(54)= 0.28, p= 0.79, although their responses were significantly higher on 6 of the 13 items.

Scale	1	2	3	4	5	6	7
Friend	-0.01	0.07	0.21	0.19	0.16	0.06	**0.68**
Romantic Partner	-0.03	0.02	**0.75**	0.09	0.07	0.01	0.12
Kin	0.00	-0.02	0.13	**0.79**	0.08	0.06	0.15
Group	0.08	**0.98**	0.01	-0.02	0.06	0.05	0.05
Sports Team	**0.96**	0.08	-0.03	0.00	0.06	0.09	-0.02
County	0.08	0.08	0.09	0.11	**0.82**	0.12	0.14
Consumer	0.12	0.05	0.01	0.06	0.12	**0.86**	0.05

*Median loading of all items in the scale

Table 2. Rotated Factor Loadings*

	Friend	Romantic Partner	Family	Group	Sports Team	National	Consumer
Friend							
Romantic Partner	0.48						
Family	0.24	0.15					
Group	0.67	0.45	0.18				
Sports Team	0.23	0.07	-0.05	0.29			
National	0.36	0.32	0.18	0.48	0.27		
Consumer	0.27	0.16	0.13	0.41	0.40	0.35	

Table 3. Matrix of Domain Correlations

	Male	Female	*t*	p-value
Friend	5.81 (1.08)	6.23 (0.82)	2.14	0.03
Romantic Partner	6.08 (1.56)	6.72 (0.82)	2.63	0.001
Romantic Partner (Infidelity)	5.92 (1.42)	6.52 (1.06)	2.97	0.01
Sports Team	5.68 (1.4)	5.34 (1.79)	0.28	0.79

Note: Table entries denote means and (standard deviations).

Table 4. Gender Differences

Discussion

As predicted from an evolutionary perspective, we found evidence of distinct kinds of loyalty (i.e., the domains were only modestly correlated; see Table 3). Moreover, factor analysis supported this in showing that each loyalty scale loaded on its own factor (see Table 2). The strongest correlation between scales is between friend loyalty and group loyalty. One potential interpretation for the correlation between friend and group loyalty is that most modern groups are made up of friends by choosing. In addition, these two kinds of loyalty, friend and group, both showed a modest correlation with romantic partner loyalty. This makes sens¬e from both an evolutionary and a modern perspective if one considers the possibility that many people consider their romantic partner as both a member of their group and also as a close personal friend. Group loyalty also showed a modest correlation with national and consumer loyalty. The correlation between group and national loyalty could be explained by the possibility that modern nations are just an extension of the groups that would have been present during the human EEA. One possible explanation for the correlation between group and consumer loyalty is that during the human EEA, if one saw others in their group successfully using an item, he might have been more likely to use that item as well. The final modest correlation is between consumer and sports team loyalty. A possible reason for this correlation is that the vast advertising investments, which many consumer companies have run during sporting events, have been associated with those sports.

We found several gender differences consistent with evolutionary theory and previous research (Table 4). Women reported significantly greater friend loyalty and romantic partner loyalty. Women's reporting greater friend loyalty was consistent with our prediction, as women appeared to have had more to gain from close individual friendships than men did during the human EEA. One advantage that women gain from individual friendships is assistance in childbirth and child rearing (Buss & Hawley, in press). Another factor to be considered is that in the human EEA men typically remained with their birth group while women typically moved to new groups. The ability to develop close interpersonal friendships would help integrate women into their new group (Geary, 2009). Women's reporting greater romantic partner loyalty, especially on items relating to infidelity, is also compatible with evolutionary theory. Women, having a larger initial investment in their offspring, will tend to be more loyal to men, in an attempt to keep the man investing resources in her child. On the other hand, a man, having only a small initial investment in his offspring, may look for opportunities to have children with other potential mates (Trivers, 1972). Additionally, men value their mate's sexual fidelity more highly than women do, as a result of paternity uncertainty that men are exposed to (Buss, 2004). This would result in more selective pressure for women to be sexually loyal.

Men, on the other hand, reported greater sports team loyalty, which can be viewed as supporting the male warrior hypothesis (Van Vugt et al., 2007). However, this difference was not significant, and men did not report greater national loyalty. One possible reason that the sex difference in sports fan loyalty was not found is that if participants did not have a favorite sports team, they could skip the sports team loyalty questions. Sixty-one percent of females responded that they did not have a favorite sports team while only 42% of males did. This suggests that while male and female sports fans are equally loyal to their team, fewer women are actually sports fans than men are.

In the future, we plan to refine the loyalty scales by gathering data from a larger sample of participants and taking steps to test the reliability and validity of the scales. For example, after having participants complete the questionnaires, we may ask them (or their friends) to report on their actual acts of loyalty or disloyalty that they have committed. In addition, we will adjust the scales so that sections cannot be skipped for the reason that someone does not have a favorite sports team or consumer brand. We plan to accomplish this by changing items to ask questions in relation to the domain rather than a favorite item within a domain (i.e., changing the item, "I would defend my favorite sports team against criticism" to "I would defend the sports team that I have seen the most, in person or on the television, against criticism"). We also hope to develop scales for additional novel loyalty domains (e.g., political loyalty, religious loyalty, short-term vs. long-term romantic partner loyalty).

The evolutionarily-informed loyalty scales we developed may have practical uses for consumer researchers (e.g., Jones, Taylor, & Bansal, 2008). In addition, they may prove useful for social psychologists of various theoretical orientations; Beer and Watson (2009) discuss the importance of relating loyalty to other personality traits. We hope eventually to employ them to address the issue of loyalty to sports teams from an evolutionary perspective (Winegard & Deaner, 2010).

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Appendix A. Items

Friend

1. I would never turn my back on a friend, even if it cost me the respect of others.
2. I would remain friends with someone despite their bad behavior.
3. I would support a friend even if they were in jail.
4. I would not betray a friend's trust.
5. If I make a promise to a friend, I will keep it.
6. My friends can always count on me.
7. I stand by my friends, even when they make mistakes.
8. I am always ready to come to the aid of a friend.
9. I would sacrifice my time and money to help a friend.
10. I am concerned about the well-being of friends.
11. I will defend my friends against criticism, even when they are not present.
12. I am loyal to my friends.

Romantic Partner

13. I would never turn my back on my romantic partner, even if it cost me the respect of others.
14. I would remain romantic partners with someone despite their bad behavior.
15. I would support my romantic partner even if they were in jail.
16. I would not betray my romantic partner's trust.
17. If I make a promise to my romantic partner, I will keep it.
18. My romantic partner can always count on me.
19. I stand by my romantic partner, even when they make mistakes.
20. I am always ready to come to the aid of my romantic partner.
21. I would sacrifice my time and money to help my romantic partner.
22. I am concerned about the well-being of my romantic partner.
23. I will defend my romantic partner against criticism, even when they are not present.
24. I am loyal to my romantic partner.
25. If a very attractive person that was not my romantic partner wanted to sleep with me, I would do so.
26. I would talk on the phone for hours with someone of the opposite sex, who was not my romantic partner.
27. If given the opportunity to I would passionately kiss someone, other than my romantic partner.
28. If my romantic partner did something that really irritated me, I would sleep with someone else to get back at them.
29. If someone that I felt a connection to other than my romantic partner indicated they were in love with me, I would return the emotions.
30. I would allow myself to develop an emotional connection with someone of the opposite sex besides my romantic partner.

Kin

31. I would never turn my back on a family member, even if it cost me the respect of others.
32. I would continue to associate with a family member despite their bad behavior.
33. I would support a family member even if they were in jail.
34. I would not betray a family member's trust.
35. If I make a promise to a family member, I will keep it.
36. My family members can always count on me.
37. I stand by my family members, even when they make mistakes.
38. I am always ready to come to the aid of a family member.
39. I would sacrifice my time and money to help a family member.
40. I am concerned about the well-being of my family members.
41. I will defend my family members against criticism, even when they are not present.
42. I am loyal to my family.

Group

43. Are you a member of a team or other group (e.g. athletic, religious, political, service, hobby, organization, etc.)? (List Group)

44. I would never turn my back on another member of (the group listed above), even if it cost me the respect of others.
45. I would remain in (the group listed above) with another member despite their bad behavior.
46. I would not betray the trust of another member of (the group listed above).
47. If I make a promise to another member of (the group listed above), I will keep it.
48. Other members of (the group listed above) can always count on me.
49. I stand by other members of (the group listed above), even when they make mistakes.
50. I am always ready to come to the aid of another member of (the group listed above).
51. I would sacrifice my time and money to help another member of (the group listed above).
52. I would be concerned about the well-being of other members of (the group listed above).
53. I would defend other members of (the group listed above) against criticism, even when they are not present.
54. I am loyal to (the group listed above).

Sports Team

55. I am a sports fan. (List favorite sports team)
56. I am a strong fan (the team listed above).
57. I would never turn my back on (the team listed above), even if it cost me the respect of others to do so.
58. I would continue to associate with (the team listed above)despite its player's bad behavior.
59. (The team listed above) could count on me to cheer for them.
60. I would stand by (the team listed above), despite mistakes that the team administration makes.
61. I would be concerned about the well-being of the team members of (the team listed above).
62. I would defend (the team listed above) against criticism.
63. I am loyal to (the team listed above).
64. I display the name or insignia of (the team listed above) at my place of work, where I live, or on my clothing.
65. If (the team listed above) was having a bad season, I would consider rooting for another team.
66. If (the team listed above) was caught cheating, I would stop rooting for them.
67. I would stop wearing clothing (e.g. ball cap, shirt, etc.) that represents (the team listed above) if they were having a terrible season.

National

68. I would never turn my back on my country, even if it cost me the respect of others to do so.
69. My nation could count on me to be loyal.
70. I would stand by my country, despite mistakes that the government makes.
71. I am concerned about the well-being of my country.
72. I would defend my country against criticism
73. I am loyal to my country.
74. It is important to show respect for my country's flag.
75. Patriotism is a quality that I admire greatly.
76. It bothers me when someone criticizes my country.
77. I am proud of my country's history.
78. When I hear someone speak out against my country or government, I wish they would shut up.

Consumer

79. What is the consumer brand (e.g. clothing brand, computer brand, car maker, etc.) that you consider yourself the most loyal to?
80. I would never turn my back (the brand listed above), even if it cost me the respect of others to do so.
81. I would remain a user of (the brand listed above) despite the behavior of others that use the same products.
82. I will continue to purchase (the brand listed above) in the future.
83. I would stand by (the brand listed above), despite negative news about it.
84. I am concerned about the well-being of (the brand listed above).
85. I would defend (the brand listed above) against criticism.
86. I would continue to use (the brand listed above) despite information showing that another brand is better.
87. I would buy (the brand listed above) even if I could get a better deal from a competing brand.
88. I would pay a higher price for (the brand listed above).
89. I am loyal to (the brand listed above).

Appendix B. Full Factor Loadings

		Factor						
Item	Scale	1	2	3	4	5	6	7
1	Friend	-0.03	0.17	0.13	0.11	0.23	0.02	0.63
2	Friend	-0.07	0.07	0.12	0.13	0.08	0.00	0.37
3	Friend	0.03	-0.05	-0.03	0.17	0.12	-0.07	0.24
4	Friend	0.02	0.07	0.18	0.16	0.24	0.10	0.75
5	Friend	0.05	0.04	0.27	0.21	0.13	0.11	0.72
6	Friend	-0.05	-0.02	0.26	0.20	0.19	0.07	0.78
7	Friend	0.00	0.06	0.23	0.22	0.19	0.08	0.62
8	Friend	-0.07	0.07	0.19	0.21	0.22	0.05	0.75
9	Friend	-0.01	0.20	0.33	0.18	0.07	0.02	0.63
10	Friend	0.01	0.02	0.27	0.15	0.13	0.18	0.72
11	Friend	-0.04	0.18	0.15	0.33	0.09	0.05	0.58
12	Friend	0.00	0.05	0.22	0.27	0.23	0.14	0.76
13	Romantic Partner	-0.03	-0.02	0.64	0.21	-0.01	0.08	0.18
14	Romantic Partner	-0.05	0.02	0.54	0.05	0.04	0.07	0.07
15	Romantic Partner	0.10	0.04	0.49	0.00	0.07	0.07	0.01
16	Romantic Partner	-0.05	0.03	0.81	0.09	0.08	0.01	0.28
17	Romantic Partner	0.01	-0.02	0.88	0.09	0.11	0.00	0.23
18	Romantic Partner	-0.06	0.04	0.86	0.11	0.05	-0.02	0.28
19	Romantic Partner	0.04	-0.10	0.75	0.04	0.01	0.00	0.17
20	Romantic Partner	-0.07	0.02	0.81	0.09	-0.04	0.04	0.11
21	Romantic Partner	0.05	-0.06	0.81	0.26	0.01	-0.03	-0.06
22	Romantic Partner	-0.07	-0.10	0.82	0.11	-0.04	0.07	0.09
23	Romantic Partner	0.09	0.08	0.54	0.23	0.04	0.01	0.08
24	Romantic Partner	-0.10	-0.02	0.83	0.07	0.14	0.02	0.12
25	Romantic Partner	0.04	0.02	0.33	0.13	0.15	0.17	0.03
26	Romantic Partner	-0.01	0.00	0.67	0.05	0.20	-0.02	0.12
27	Romantic Partner	-0.03	0.07	0.77	0.19	0.08	0.02	0.25
28	Romantic Partner	0.04	0.10	0.52	0.10	0.17	-0.01	0.13
29	Romantic Partner	-0.08	0.04	0.51	0.08	0.13	-0.09	0.10
30	Romantic Partner	-0.17	0.11	0.75	-0.01	0.08	-0.04	0.12
31	Kin	0.04	-0.03	0.09	0.85	0.14	0.08	0.04
32	Kin	-0.01	-0.06	0.01	0.75	0.03	0.11	0.00

33	Kin	0.04	-0.01	0.01	0.65	-0.01	0.03	-0.03
34	Kin	-0.01	0.05	0.11	0.70	0.04	0.14	0.31
35	Kin	-0.07	0.07	0.14	0.74	0.03	0.06	0.41
36	Kin	-0.06	-0.03	0.24	0.79	0.16	0.08	0.24
37	Kin	0.00	-0.04	0.14	0.85	0.10	0.08	0.22
38	Kin	0.02	-0.05	0.15	0.85	0.17	0.05	0.13
39	Kin	0.00	-0.02	0.09	0.85	0.06	0.02	0.13
40	Kin	-0.02	-0.03	0.16	0.71	-0.02	0.01	0.00
41	Kin	0.01	0.06	0.08	0.80	0.14	0.05	0.21
42	Kin	0.04	0.01	0.14	0.86	0.14	0.06	0.18
44	Group	0.08	0.96	-0.01	0.06	0.09	0.07	0.00
45	Group	0.04	0.93	0.01	0.05	0.10	0.04	0.03
46	Group	0.07	0.98	0.01	-0.03	0.06	0.07	0.09
47	Group	0.11	0.97	0.02	-0.02	0.03	0.05	0.09
48	Group	0.10	0.98	0.01	-0.02	0.06	0.07	0.08
49	Group	0.07	0.98	0.01	0.01	0.09	0.02	0.04
50	Group	0.07	0.98	0.01	-0.03	0.06	0.05	0.06
51	Group	0.06	0.98	0.03	-0.02	0.03	0.03	0.04
52	Group	0.10	0.98	0.00	-0.03	0.04	0.04	0.03
53	Group	0.08	0.98	0.00	0.00	0.08	0.02	0.05
54	Group	0.08	0.97	0.01	-0.02	0.11	0.06	0.08
56	Sports Team	0.94	0.05	-0.08	0.04	0.11	0.08	0.02
57	Sports Team	0.96	0.10	0.00	-0.03	0.08	0.10	0.02
58	Sports Team	0.93	0.09	0.00	-0.02	0.03	0.13	-0.03
59	Sports Team	0.98	0.08	-0.07	0.01	0.06	0.09	0.01
60	Sports Team	0.96	0.10	-0.03	-0.02	0.04	0.10	0.05
61	Sports Team	0.94	0.09	-0.02	0.01	0.09	0.13	0.03
62	Sports Team	0.96	0.10	-0.06	0.01	0.06	0.12	-0.04
63	Sports Team	0.96	0.08	-0.05	0.00	0.06	0.09	-0.01
64	Sports Team	0.89	0.04	0.00	0.01	0.16	0.13	-0.04
65	Sports Team	0.96	0.05	0.02	-0.01	0.04	0.06	-0.04
66	Sports Team	0.89	0.04	-0.04	0.01	0.03	0.02	-0.03
67	Sports Team	0.96	0.07	-0.03	-0.01	0.03	0.08	-0.03
68	National	0.12	0.10	0.09	0.12	0.86	0.18	0.14

69	National	0.12	0.11	0.15	0.11	0.85	0.17	0.18
70	National	0.10	0.06	0.06	0.10	0.82	0.12	0.13
71	National	0.08	0.14	0.26	0.13	0.33	0.09	0.31
72	National	0.15	0.08	0.08	0.07	0.85	0.13	0.13
73	National	0.00	0.18	0.09	0.11	0.81	0.06	0.16
74	National	0.02	0.04	0.11	0.10	0.84	0.12	0.15
75	National	0.05	0.11	0.10	0.03	0.88	0.13	0.12
76	National	0.04	-0.01	-0.04	0.17	0.81	0.06	0.08
77	National	0.18	0.06	0.05	-0.01	0.75	0.12	0.17
78	National	0.05	0.06	-0.03	0.13	0.81	0.07	0.07
80	Consumer	0.12	0.04	0.02	-0.03	0.27	0.80	0.06
81	Consumer	0.17	0.06	0.03	0.10	-0.02	0.85	0.05
82	Consumer	0.12	0.08	0.03	0.07	-0.05	0.89	0.04
83	Consumer	0.05	0.10	-0.02	0.02	0.23	0.87	0.12
84	Consumer	0.11	0.03	0.08	0.12	0.17	0.76	0.01
85	Consumer	0.15	0.09	0.00	0.05	0.09	0.90	0.05
86	Consumer	0.05	0.05	-0.01	0.00	0.26	0.82	0.10
87	Consumer	0.05	0.05	-0.02	0.10	0.12	0.88	0.00
88	Consumer	0.15	-0.02	0.00	0.15	-0.02	0.84	0.05
89	Consumer	0.17	0.04	0.03	0.03	0.12	0.92	0.14

Teaching Play Activities to Children with Autism Comparing Adult and Peer Models

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Abstract

Video modeling is a strategy used to teach skills to children with autism. Few researchers have investigated whether peer or adult video models are more effective in teaching skills such as play. While typical children may learn better from peers than adults, it is possible that children with autism do not detect differences between peer and adult models and learn equally well from both. This study used a multiple baseline design to assess whether video modeling was associated with changes in the frequency of appropriate play behaviors for two preschoolers with autism. Results showed that the video modeling intervention increased modeled toy play for both participants, while only one participant demonstrated better performance with adult models. These results are discussed, and implications for future research are outlined.

Introduction

Today, it is estimated that one in every 110 children is diagnosed with an Autism Spectrum Disorder (Centers for Disease Control, 2010). Autism is a developmental disorder that appears in the first 3 years of life and affects the brain's normal development of social, cognitive, and communication skills (American Psychiatric Association [DSM-IV-TR], 2000). This affects the way a child perceives the world, and it makes communication and social interaction difficult. Typically-developing children generally learn social interaction and symbolism through play, usually with toys or by observing others. Many children with autism lack these skills and instead demonstrate repetitive behaviors or intense interests that interfere with social interactions. They will play with a single toy to the exclusion of all others, or arrange toys in precise stacks or lines. They also lack pretend play skills and are sometimes unable to use one object to represent another symbolically, such as using a banana as a telephone.

Play provides a plethora of benefits to developing children. It is an important part of social development. Play provides an avenue for practicing culturally and socially important activities and preparing the child for life (Jordan, 2003). It is the medium through which children develop skills, experiment with roles, and interact with others. Children develop social and communication skills by playing with other children. They also develop cognitive and abstract thinking skills by playing with toys. By improving the play skills of children with autism, social interactions and communication skills may also be improved.

Typically-developing children learn and practice social behaviors by engaging in cooperative and parallel play. Children with autism, however, usually show deficits in these areas (DSM-IV-TR, 2000). Rather than playing near and with other children, children on the autism spectrum may show repetitive play behaviors with

specific toys, and they may avoid including others in these play activities. It would be logical to propose that if appropriate play behaviors in children with autism were improved, then opportunities for social interactions would also increase.

Behavioral Strategies to Improve Play Skills

Behavioral methods are often used to improve the play skills of children with autism. Skills can be taught in isolation, that is, a researcher can teach a child play skills that can be used alone or with others. This method helps children with autism learn skills that will help them play with peers (Terpstra, 2002). For instance, after learning isolated play skills, children demonstrated more ideas about how to play with the toys during spontaneous play when cues and instruction were provided (Lewis & Boucher, 1995). Discrete trial training is a behavioral method used to teach play skills to children with autism. This involves breaking down complex skills into smaller sub-skills. These sub-skills are then taught through a series of massed teaching trials. In discrete trial training, the learning environment is highly structured and controlled by the therapist. Play materials are chosen by the teacher, and the child is presented with a clear instruction to elicit a response. Acquisition is facilitated by the use of explicit prompting and shaping techniques, and systematic reinforcement is provided contingent upon the child's production of the target response (Ingersoll, 2003). Another behavioral method that can be used to teach play is Pivotal Response Training. This method is designed to increase a child's motivation to participate in new learning activities and can be used in either a structured environment or a naturalistic setting (Stahmer, Ingersoll, & Carter, 2003). Pivotal Response Training is a naturalistic training method that is structured enough to allow children to learn both simple and complex skills while still allowing for creative opportunities during play.

Video Modeling

Increasingly, research has focused on video modeling to improve the skills and social interactions of children with autism. Video modeling involves videotaping an individual who is performing target behaviors. This video is then shown to the child, and the child is expected to imitate the behaviors she or he observed in the video. It has been suggested that video modeling may be effective for children with autism because television is an engaging medium that leads to longer sustained attention while it also does not require social interaction (Charlop-Christy, Le, & Freeman, 2000). Video modeling could be considered more advantageous than in vivo modeling for several reasons. First, the cost of making videotapes can be lower than the cost of bringing therapists into the chosen setting to serve as models. Also, a videotape can be used anywhere there is a playback device. A video can be played repeatedly, giving the child a chance to watch the video more closely and practice a skill. Finally, tasks on video can be shown and taught in a standardized way, which might make a skill easier to learn (Charlop-Christy, Le, & Freeman, 2000).

Video modeling has been used to teach a wide variety of skills to individuals across a range of disabilities and ages (Maione & Mirenda, 2006). In one study by Cihak, Fahrenkrog, Ayres, and Smith (2010), four students with autism improved transitioning skills using video modeling. The children were shown an iPod video of themselves properly transitioning from one place to another. All four children were able to transition more independently when the intervention was in place than when it was not. In a similar study using video modeling, Keen, Brannigan, and Cuskelly (2007) used an animated toilet training video along with operant conditioning strategies to teach daytime urinary control to five boys with autism. Frequency of in-toilet urination was found to be greater for the children who watched the video in conjunction with the operant conditioning than for those who only received the operant conditioning treatment.

Only a few studies have explored the use of video modeling to teach social play and toy play skills. In an early study of the use of video modeling to improve play, Charlop and Milstein (1989) increased levels of correct responding to questions about particular toys in three boys with autism by having them observe video conversations of two people discussing toys. Correct responding generalized across novel topics of conversation, people, and toys and was maintained for 15 months. In another study, Nikopoulos and Keenan (2004) showed that video modeling successfully improved the social initiations of three children with autism. The children watched a video featuring a typically-developing peer and an experimenter engaged in social interactive play using one toy. All three children showed improvements in social initiations and reciprocal play, with effects being maintained for three months. Taylor, Levin, and Jasper (1999) conducted a study to teach play-related statements to two boys with autism. They videotaped an adult model performing a scripted routine with each of the boys' siblings and then showed each boy the video with their sibling. An increase in the scripted play-related statements was shown as well as an increase in unscripted play-related statements. Video modeling has also been used to teach complex play sequences to children with autism. Tereshko, MacDonald, and Ahearn (2010) created a segmented video of a model performing an eight-step sequence to build a toy structure that resembled a monster. The video was then shown to four boys with autism to teach them to imitate the same eight-step sequence and create the same toy structure the model in the video created.

Although there have been several studies demonstrating the effectiveness of video modeling to teach play, there is still only limited understanding of the types of models that make this strategy most successful. For example, early work by Bandura (1977) suggested that individuals were more likely to model behaviors if the model was similar to the observer. From this perspective, we might hypothesize that children with autism would respond better to peer models than to adult models. If this is the case, we might expect to see greater increases in modeled behaviors when peer models are viewed than when adult models are viewed. In the only known study that looked directly at this issue, Jones and Schwartz (2004) showed that children with autism demonstrated no clear preference for a single model, although some of the children did respond correctly to the presented stimuli more often when a child (either peer or sibling) was used in the video rather than an adult model. However, this

study looked at video modeling to teach academic concepts, such as labeling "actions," "opposites," and "professions" in pictures. It is unclear whether child models would be more beneficial for teaching play-based activities; therefore, further research on model features in the context of play interactions is desirable.

The present study was initiated to assess further the utility of video modeling in teaching play skills and play verbalizations to preschoolers with autism. Furthermore, the present study was also designed to evaluate whether the age of the model was an important factor in teaching play behaviors. Specifically, the study was designed to assess whether the play skills of children with autism improved more in conditions where peer models were viewed, as opposed to conditions where adult models were viewed.

Methods

Participants

Two boys participated in this study. Parental consent was obtained for both children, and each student participated for approximately 4-6 months. Participant 1, Jeremy, was 3 years, 5 months at the time the study was initiated. On Jeremy's most recent pre-study testing, conducted at 30 months of age, he received a standard score of 57 on the Mullen Scales of Early Learning, a score that suggested a significant cognitive delay. Jeremy showed the most significant deficits in Receptive and Expressive Communication skills, although he demonstrated emerging language at the time the study was conducted. Participant 2, David, was 3 years, 9 months at the time the study was initiated. Although formal cognitive testing scores were not available, David's Adaptive Behavior Composite score of 74 on the Vineland-II Adaptive Behavior Scales was in the Moderately Low range, and David's Communication and Socialization scores were also in the Moderately Low level. Both participants had been educationally classified as meeting criteria for an Autism Spectrum Disorder and were currently receiving services in classrooms designed for preschoolers on the autism spectrum.

Toy Set	*Toys*
Blocks & Cars	• Cardboard blocks • 3 toy cars, varied sizes
Farm	• Barn • Plastic farm animals
Music	• Drum & drumsticks • Tambourine
Play Food	• Toy food • Pans, plates • Toaster • Food basket

Table 1. Toys used in the study

Materials

The toys used in this study included a barn with animals, musical instruments, toy food, cars, and blocks (see Table 1).

Video Models and Video Intervention

Prior to initiating the study, experimenters created videos of peer and adult models playing appropriately with the toys described in Table 1. The peer models were a boy (age 7) and a girl (age 5). As the first step in creating the video modeling segments, peer models were videotaped playing with and talking about the toys available in the session room. Brief segments of appropriate play were then clipped together to show a series of appropriate play actions and statements. For the purposes of this study, two peer video clips were created. These clips totaled approximately 3-min in length when both were viewed consecutively. The play behaviors and verbalizations of the child models were then transcribed to allow experimenters to create videos of the adult models engaging in identical actions and play statements. The adult models were both female undergraduate students at a local university who volunteered for the study. The two adult models were videotaped playing with the toys following the transcribed notes from the peer modeling sessions. Again, these videos were clipped together to show an identical sequence of play behaviors and statements. The two clips of adult models were viewed consecutively, and both sessions together totaled approximately 3-min in length.

Design and Procedure

This study used a multiple baseline across participants with an alternating treatments design to evaluate whether there was an effect in regards to the treatment and model types used (Cooper, Heron, & Heward, 2007).

Baseline sessions.

Baseline sessions were conducted in a small 8' x 8' room adjacent to participant classrooms. The examiner placed the toy sets on the floor of the room in random order and gave the child the instruction, "Let's play." The child was videotaped for three minutes playing with the toys. Every thirty seconds or when the child changed activities, the experimenter provided a prompt (i.e., "What are you doing?"). This prompt was used to elicit verbal commenting and social engagement. No other prompts were provided during baseline sessions.

Intervention sessions.

Intervention sessions took place in the same room. Initially, participants were seated at a table and observed videos of either peer models (A phase) or adult models (B phase) playing appropriately with the toys. Videos were played on a laptop. After watching the videos, the experimenter closed the laptop and moved the child from the table. The experimenter provided the same instruction ("Let's play") and used the same prompt rules (i.e., the experimenter stated, "What are you doing?" approximately every 30-sec or when the

child changed activities). The child was videotaped during play with the toys for three minutes.

Measures

An undergraduate student who was receiving credit for a psychology course transcribed the digitally-recorded sessions. The transcribed sessions were then coded for modeled play behaviors and modeled verbal behaviors by two different undergraduate student volunteers. Approximately 30% of transcribed sessions were coded by two independent observers to allow for calculation of reliability.

The following measures were scored from videotaped sessions: modeled play behavior, and modeled play statements. Modeled play behaviors and play statements are described in Tables 2 and 3. Modeled play behaviors were defined as any play action that was performed by the video model (e.g., popping the toast from the toaster, building a tower out of blocks and knocking it down with a toy car). Modeled play statements were defined as verbal words or phrases related to play that were modeled in the videos.

Modeled Behaviors			
	A		B
1	builds tower with blocks	1	places an animal at trough
2	pushes car on floor	2	places animals in barn
3	knocks down block tower with car	3	takes animal out of barn
4	puts drum strap over neck	4	marches and bangs on drum
5	bangs on drum with drumsticks	5	makes sandwich (2 pieces)
6	hits or shakes tambourine	6	eats sandwich
7	eats French fries	7	pops food item from toaster
8	places animals in barn	8	puts ketchup on hotdog
9	closes gate (inner door)	9	eats hot dog
10	closes barn (outer door)	10	opens u-shape made from blocks
		11	drives car between blocks
		12	eats food item from toaster
		13	knocks down blocks with hand

Table 2. Modeled Behaviors separated by model A and model B

Modeled Verbalizations			
	A		B
1	uh-oh	1	I'm giving the animals a drink
2	marching in a band	2	moo, moo
3	playing the tambourine	3	rooster noise
4	eating French fries	4	baaaa
5	they're all gonna go asleep	5	neigh
		6	I'm playing the drums
		7	making a sandwich
		8	I'm making toast
		9	making a hotdog
		10	I'm putting the cars in the garage
		11	I'm building a tower then I'm
			gonna knock it down

Table 3. Modeled Verbalizations separated by model A and model B

Results

In order to evaluate the overall effectiveness of the video modeling intervention to teach play skills, peer and adult sessions were combined in Figures 1 and 2. The frequency of modeled play actions performed by the children is shown in Figure 1. During baseline, the children engaged in only a few modeled play behaviors and verbalizations. Participant 1 averaged 4.71 modeled play behaviors per session and participant 2 averaged 4.45 modeled play behaviors per session during baseline. Both children showed increases in modeled play actions during the intervention phase. The frequency of modeled actions following intervention ranged from 2 to 18 modeled play behaviors each session, with an average of 8.38 modeled play behaviors per session for participant 1 and 11.25 modeled play behaviors per session for participant 2.

The frequency of modeled verbalizations performed by the children is shown in Figure 2 below. During baseline the children used the modeled verbalizations rarely. Only David showed an increase in modeled verbalizations during the intervention phase. David's verbalizations increased from an average of 0.27 modeled verbal statements in baseline to an average of 6.22 modeled verbal statements in the intervention phase.

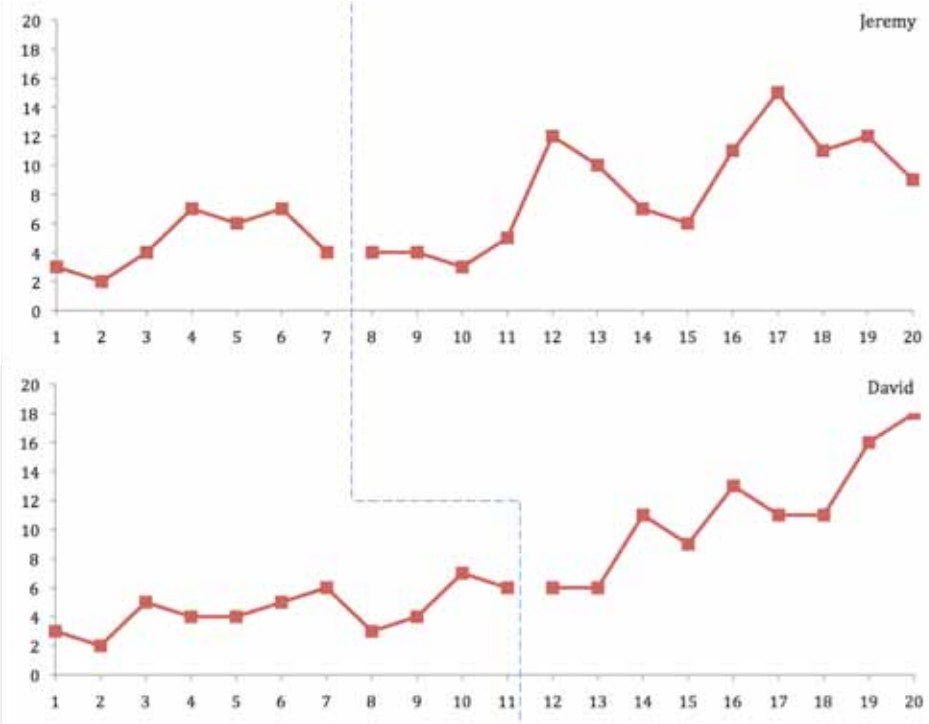

Figure 1. Modeled Play (Reliability 83.8% range 66.67%-100%)

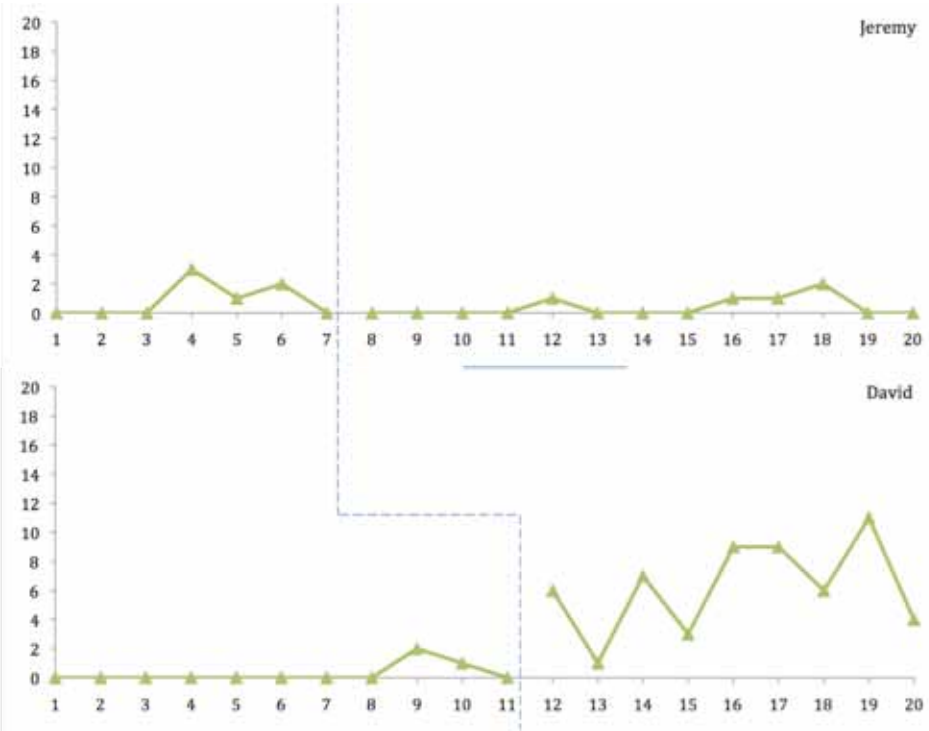

Figure 2. Modeled Verbalizations (Reliability 95.83% range 50%-100%)

In order to assess whether peer or adult models were more effective in teaching play skills, intervention sessions were also separated by adult condition and peer condition, and the overall averages were calculated. For modeled behaviors (Figure 3), Jeremy showed a preference for the adult models while David did not show any model preference.

For modeled verbalizations (Figure 4), Jeremy showed a slight preference for the peer model over the adult model. Again, David showed no preference for either the adult or the peer model.

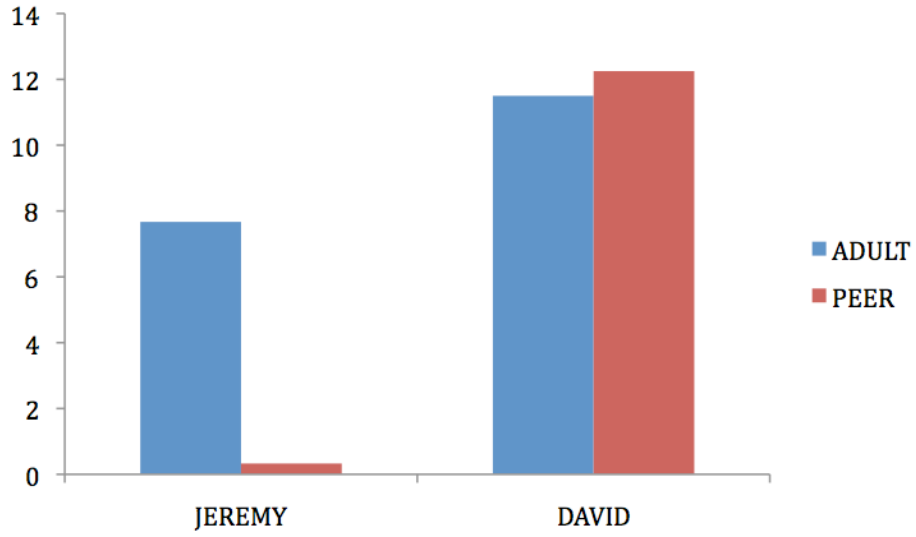

Figure 3. Adult versus Peer Modeling for modeled behaviors separated by child

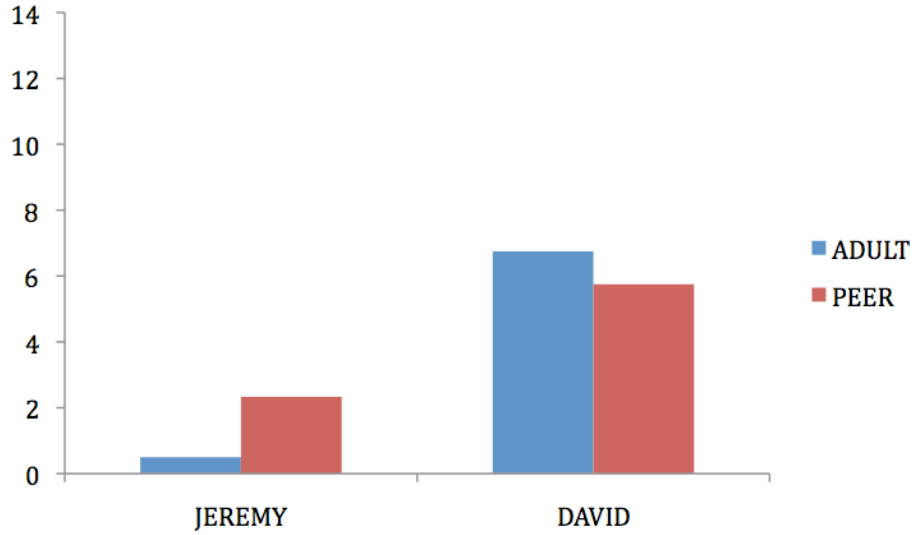

Figure 4. Adult versus Peer Modeling for modeled verbalizations

Discussion

Both participants responded positively to video modeling, demonstrating gradual increases in modeled play behaviors after observing video models performing these actions. These results are consistent with those of other researchers (Charlop & Milstein, 1989, Nikopoulos & Keenan, 2004, Taylor, Levin & Jasper, 1999) who have reported that video modeling is a useful tool for teaching young children with autism important social-play skills.

One of the benefits of video modeling is that it is a low-cost intervention in terms of time and staff resources. In this study, after approximately five sessions, which translates to about 15 minutes of intervention time, each participant showed a marked increase in the frequency of modeled behaviors. This presents a large contrast with discrete trial training, where intervention can often require high levels of staffing and dedicated resources. Whereas discrete trial training requires that staff use systematic prompting and reinforcement strategies, video modeling does not necessarily require these additional features. Given the difficult economic climate facing many schools, video modeling may be an ideal adjunctive intervention that can be used to teach certain skills effectively, even during times when personnel are not available to conduct one-to-one teaching. Future studies might more carefully assess how video modeling might be used as a supplementary intervention within a child's educational program.

This study did not demonstrate a consistent effect of video modeling on play verbalizations (Figure 2). Although David did show significant increases in modeled play statements, Jeremy did not improve in his verbalizations following intervention. It is unclear why this would be the case, but it is possible that Jeremy's poor articulation may have contributed to his deficient performance in this area. Because Jeremy was difficult to understand, many of his verbalizations could not be scored as accurate imitations of video statements made by peers or adults. It is possible that for children with particularly poor articulation, additional services may be needed to assure improvements in articulation. While video modeling may be helpful, just hearing the statements may not be enough if the child cannot correctly form the sounds and words that are depicted in the videos.

When the intervention sessions were separated by adult and peer conditions, Jeremy showed a marked preference for the adult models. It is possible that this difference emerged because adult models more explicitly showcased the target behaviors, making it easier for Jeremy to imitate those behaviors. For example, adults may be more deliberate and obvious as they engage in scripted behaviors, as opposed to when children engage in natural play that is less clear and distinct. However, this difference may be artificial, as there were not enough sessions to de-

termine fully whether this was a consistent effect. The design of the study also leaves open the possibility that there was carry over from one condition to the next. One day the participant observed peer models displaying play behaviors, and the next day he observed adult models displaying the same behaviors. Given the memory strengths often demonstrated by children with autism, it is possible that the participants were modeling behaviors viewed from prior intervention sessions; therefore, it is unclear whether the model's age alone determined their performance.

There was some anecdotal evidence from the study suggesting that several other aspects of behavior may have improved as a result of the intervention. Among these were echolalia, repetitive behaviors, and engagement with the examiner. Future researchers could assess whether video modeling interventions systematically affect these behaviors through designing video modeling interventions that specifically address these targets.

The current results are somewhat limited by lack of maintenance and generalization data. Due to the fact that participants moved to new school placements in geographically-distant buildings during the school year, it was difficult to conduct the study long enough to address whether the play skills were maintained across time and/or whether they generalized to different environments (e.g., the school classroom) or to similar toys (e.g., similar, but non-identical blocks). Despite these limitations, the current project serves to add to the growing body of research that supports the use of video modeling to teach young children with autism to engage in play skills. Given the importance of play skills in leading to positive social, cognitive, and developmental outcomes, it is important to direct targeted efforts toward teaching and promoting play in young children with autism. Video modeling is one intervention that can efficiently and successfully improve skills in this area. Although our knowledge of the features of video models that make this intervention most impactful is only emerging, this study, coupled with future research on model characteristics, will help to determine how practitioners can successfully impact outcomes for preschoolers with autism.

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Applying Anthropology to Water Quality Assessment: An Investigation of pH and Nitrates in Drinking Water

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Abstract

Anxiety disorders affect roughly 40 million American adults in a given year. Those suffering from anxiety disorders often experience additional stress-linked illnesses, such as depression. Previous research has shown that stress exposure increases levels of the endogenous neuropeptide dynorphin, which the kappa opioid system is selectively activated by. This study examined the role of the kappa opioid system in regulating stress-related behavior using the elevated plus-maze. Behavioral stress responses were examined in male Wistar rats following i.p. administration of opioid agonist U-50,488 (0 or 10 mg/kg). Subjects were pretreated with the kappa opioid antagonist nor-binaltorphimine (nor-BNI) 24 hours prior to testing in the elevated plus-maze (0 or 20 mg/kg). Injections of 10 mg/kg U-50,488 significantly decreased percent open arm time compared to controls, an effect reversed by pretreatment with 20 mg/kg nor-BNI ($F(1,44) = 6.10$, $p < 0.05$). A main effect of nor-BNI was found on the total number of arm entries ($F(1,44) = 11.73$, $p < 0.05$). Further analysis revealed that pretreatment with nor-BNI led to an increased number of arm entries in rats injected with U-50,488. The nor-BNI sensitivity of the behavioral responses suggests an activation of the kappa opioid receptors by a stress-induced release of dynorphin. The results indicate a relationship between kappa opioid receptors and stress-related behaviors and illustrate the potential therapeutic value of targeting the kappa opioid system in the treatment of anxiety and other stress-related disorders. Introduction

Introduction

This study focuses on the demographic factors that influence people's perceptions of their drinking water quality in West Michigan. According to the World Health Organization (WHO) and UNICEF, approximately 2.6 billion people worldwide are without improved water sanitation facilities, and 884 million do not use improved sources of drinking water (WHO/UNICEF 2008). Water quality is a global concern, as contamination of water sources occurs in both underdeveloped and industrialized countries. For example, in underdeveloped regions, thousands die each year from preventable waterborne disease due to the ingestion of contaminated water. In industrialized countries such as the United States, one would assume there would be no water quality issues, yet this is not the case. Across the country, people are exposed to certain contaminants above the safety ranges set by the EPA. This pilot study examines 105 drinking water samples and corresponding homeowner surveys collected from households throughout West Michigan. The water was tested for pH and presence of nitrates, and homeowner survey responses were examined for demographic factors, as well as knowledge and perception of water quality. These results can be used to critique public policy and determine areas for improvement. In this study, I address a global problem at a community level.

Health Concerns of pH and Nitrates

An immediate question one may ask is, why is investigating for the presence of nitrates and pH levels in drinking water necessary? The appropriate pH of a water sample is very important because serious health problems can result if it is not within the standard limit set forth by the EPA. For example, if a sample of water is below the EPA's standard limit, then the sample is acidic, thus having the potential to cause serious tissues damage to the body. The same idea applies when the pH of a water sample is well above the standard limit.

Although studies remain inconclusive as to the health effects of excessive levels of nitrate, a number have discovered that nitrates might cause what is commonly referred to as "Blue Baby Syndrome." Infants below the age of six months are especially susceptible. Blue Baby Syndrome occurs when the oxygen-carrying capacity of red blood cells is significantly reduced because of high levels of nitrates in the body. The veins and skin of the individual appear blue, which is how the disorder acquired its name. According to the United States Geological Survey (USGS), nitrates are the most common inorganic contaminant from man-made sources (DeSimone et al. 2009:48). Nitrates are present in rainwater and can leach through the soil and into the groundwater, which can contaminate water from private wells. Undoubtedly the most prevalent source of nitrates is nitrogen-based fertilizers used in agricultural activity widely practiced throughout the country. Other sources of nitrates include wastewater treatment plants and the erosion of natural deposits, which include decaying plant and animal residues.

Research Questions and Hypotheses

This study focuses on how people's perceptions can influence their water use. Each day people are unknowingly exposed to contaminants in their drinking water, and because of this unawareness, they still consider it safe to drink. One of the goals of this research is to evaluate the quality of drinking water in West Michigan by assessing the pH and nitrate levels. Nitrate is a naturally occurring ion that is colorless, odorless, and tasteless. Because it does not produce an odor or any aesthetic problems, people may be unaware of its presence in their drinking water and the potential health impact it can have at significant levels. This study also hopes to address improvements to public policy and awareness.

The research project has three main hypotheses:

1. The pH and nitrate levels will exceed the maximum contaminant level (MCL).
2. Households will overall be satisfied with the quality of their drinking water.
3. The perception of water quality is positively correlated with homeowner educational level and household income.

Methodology

The study area of West Michigan includes Ottawa County, Kent County, Allegan County, and Muskegon County. A larger anthropological survey conducted by Grand Valley State University anthropologists in 2008 and 2009 investigated both water quality and radon levels to inform public outreach in West Michigan. It included over 300 households. From this larger sample, 105 households were randomly selected for this study, and household drinking water samples were tested for pH levels and the presence of nitrates. Each household was given a de-identification number. In addition, the water quality specific survey questions from the project were tabulated for these 105 households for qualitative data on their perception of water quality.

Testing for the presence of nitrates was done using a standard nitrate kit, and the pH was measured using a pH meter. The accepted range for the pH of drinking water is 6 to 8.5. After a bar-coded vial was prepared, it was inserted into a spectrophotometer. The machine would read the barcode on the vial, select the appropriate measurement test, and then a nitrate value would appear. For the one water sample that exceeded 10 mg/L, a color change occurred. This action was not observed with the rest of the samples.

Coding of the survey data was done by assigning numerical values to close-ended questions and open-ended questions. For example, when homeowners were asked to select "male" or "female" to indicate gender, "male" was assigned the number 1 and "female" was assigned the number 2. The numerical assignment was used for other socioeconomic data responses and responses concerning environment and health. Because the responses came from a larger survey about radon and water quality, for this study I only looked at the questions that were relevant to water quality. The open-ended responses were entered into an Excel spreadsheet verbatim as they were answered by respondents.

Drinking water systems

Drinking water systems in the United States are divided into two main categories: public water systems and private water systems. In addition, 1.12 million Michigan households are supplied by private wells (Figure 1).

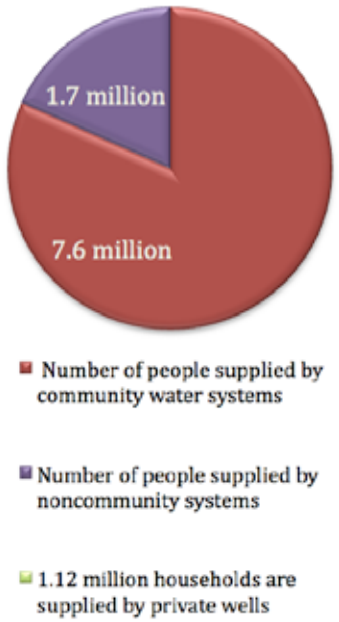

Figure 1: Michigan's Drinking Water Systems.

According to the EPA, public water systems are categorized as community or non community systems. Community water systems supply water to the same population year round, whereas non community systems do not supply water on a regular basis to the same population (USEPA 2011). Michigan has 1,500 community water supply systems serving 7.6 million people and 11,000 non community systems serving 1.7 million people (Michigan Department of Natural Resources and Environment [DEQ] 2003). Individual water systems are comprised of privately-owned wells, springs, or other surface water sources (DEQ 2003). Currently Michigan has 1.12 million households using private wells. Michigan's numbers are not inconsistent with the United States as a whole; 15% (43 million people) in the U.S. use drinking water from private wells (Hutson et al. 2004:46).

Results

Water Testing

Testing for the presence of nitrates was done using a standard nitrate kit, and the pH was measured using a pH meter. The accepted range for the pH of drinking water is 6 to 8.5. There were six samples that exceeded 8.5 (Figure 2). The standard range for nitrates in drinking water is 0 to 10 mg/L. Only one sample, which came from a private well, contained nitrates above the USEPA safety range, measuring at 12mg/L (Figure 3).

Water Survey

One hundred and five drinking water samples were collected from homes throughout West Michigan. Of the 105 households surveyed, seven are from Allendale, 34 from Grand Rapids, 15 from Jenison, and nine are from Kalamazoo. The educational level of each household surveyed is represented (Figure 5) below. Out of the 105 households, nine have a high school diploma, 34 have "some college" background, another 34 hold a four year college degree, and 26 households hold a graduate school degree. From the 105 homeowners surveyed, 47% are female, and 53% are male. The ages of the respondents range from 19-81 years. 9.7% of the homeowners are between 19-24 years of age, 12.6% are 36-32 years, 17.4% are 33-39 years, 9.7% are 40-45 years, 12.6% are 47-52 years, 17.4% are 53-59 years, 8.7% are 60-66 years, 7.8% are 67-72 years, and lastly, 3.9% of the homeowners are 75-81 years of age.

As to the primary source of drinking water, 57 households use municipality/city water as their primary source, and out of those households, 49% filter their drinking water while the remaining 51% do not filter their water. Nineteen households primarily use well water. Seventy-nine percent of the homeowners filter their well water, whereas 21% do not filter their water. There are also 20 households that use a combination of municipality/city water and bottle water as their primary drinking water source. Only 15% of these households filter their drinking water, while 85% do not filter their drinking water.

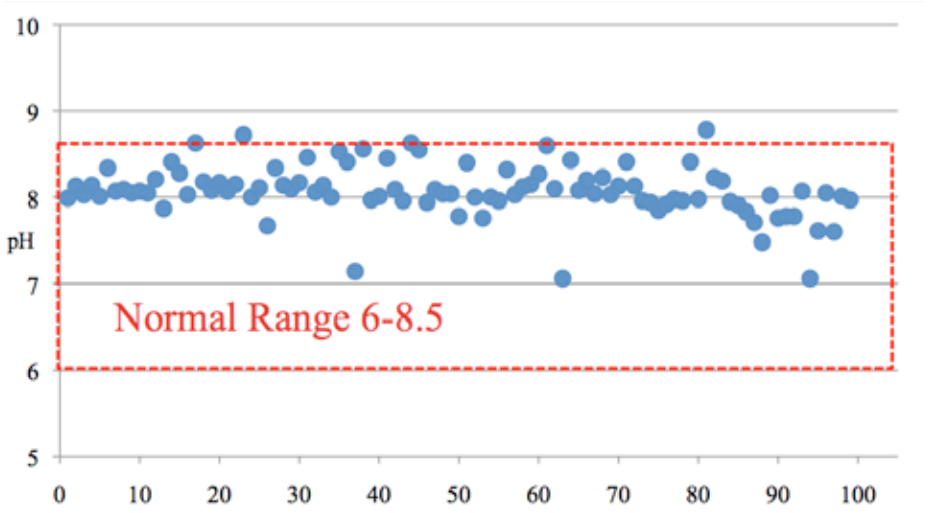

Figure 2. pH Results

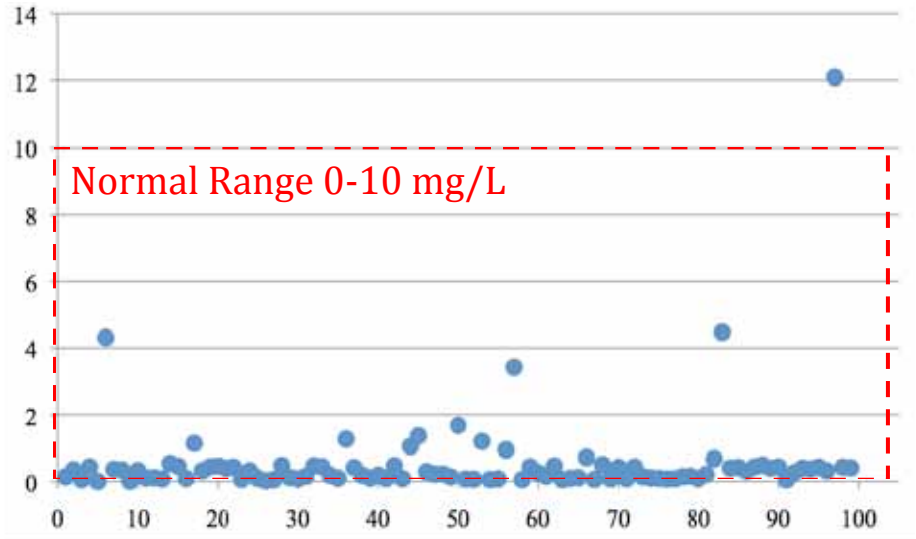

Figure 3. Nitrate Results

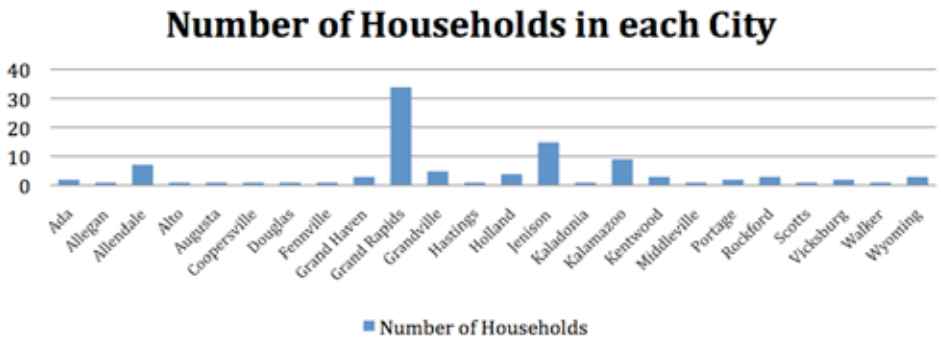

Figure 4. Number of Households in each City

Survey Analysis

For this study, 105 surveys were used, and responses to certain questions were analyzed. Unfortunately, due to mislabeling and unclear paperwork, some surveys were eliminated. Therefore, 103 surveys are included in the analysis. Homeowners were asked in the survey, "What, if anything, do you want to convey to policy makers about drinking water?" The responses to this question can be grouped into three main concerns.

- "Drinking water should be tested/ people should be concerned."
- "Not applicable," "No comment," or left blank.
- "Satisfied" or "Not concerned."

The responses to this question in particular were especially important because it gave me an idea of the level of awareness homeowners have about the quality of their water. Subsequently, I was able to compare their level of awareness with their demographic information, such as location, educational level, owning or renting the home, source of drinking water, etc., to see if there were any identifiable relationships which would help answer my research questions.

Of the 103 households surveyed, 35% of the respondents felt their drinking water should be tested and that there should be increased concern for the quality of their drinking water. In addition, 10% of the respondents were satisfied or not concerned with the quality of their water. Interestingly, 31% of respondents had no comment or left the response blank. Only 15% of the respondents felt that there was a need to increase public awareness and educate people about water quality and testing. But only 3% of the respondents felt that this information was important enough to be conveyed to policy makers.

Surprisingly, while concern was expressed about testing, only 44% of these respondents filter their water (55% do not). In addition, 72% do not test their own water, whereas only 38% test their water for contaminants. Moreover, 44% of these respondents did not give any response when asked if they know of any government or private agency that tests for water.

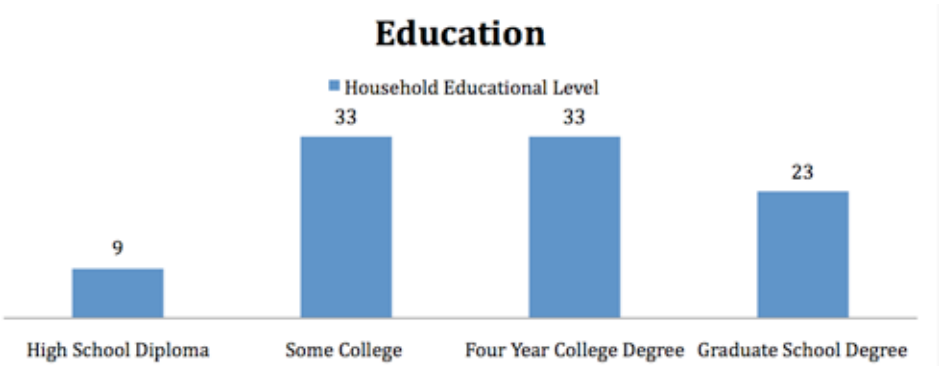

Figure 5. Distribution of Household Educational Level

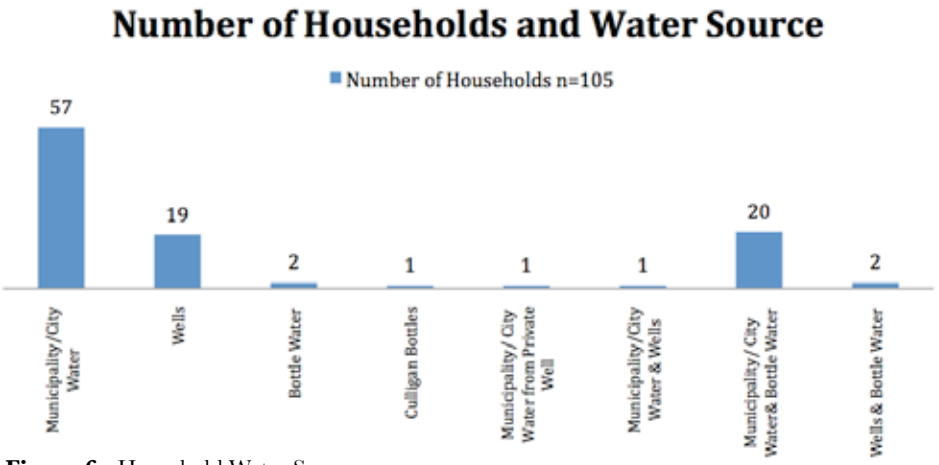

Figure 6. Household Water Sources

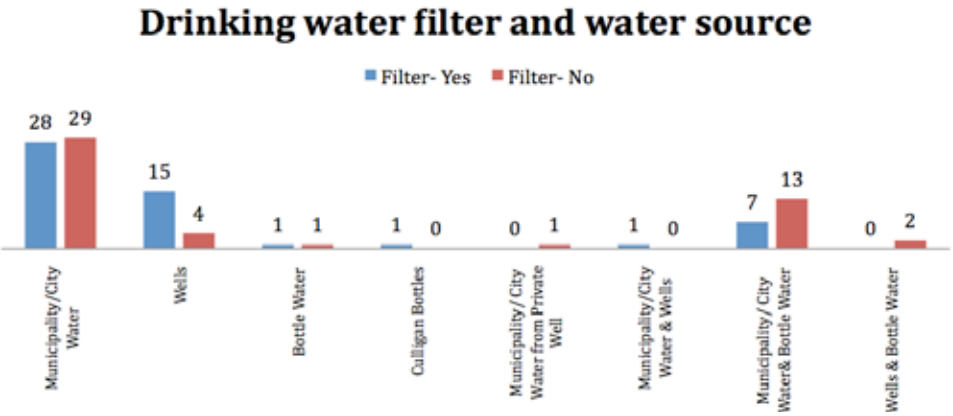

Figure 7. Households that filter or do not filter their drinking water

All of the respondents who were either satisfied or not concerned about the quality of their drinking water own their homes. It is important to note that 60% of these respondents do not filter their water (40% do), and 90% do not test their drinking water for contaminants. Additionally, 70% of the respondents did not give a response when asked if they know of any government or private agency that tests for water. Five of these homeowners who gave no response have not had their water tested for contaminants. If half of the respondents who are satisfied with their water quality have not had their water tested and do not know where to have it tested, then how can they be certain their water is indeed safe to drink? It is clear that the respondents are confident that someone is safeguarding their water quality, even if they do not precisely know who that would be or what the hazards are.

As stated earlier, out of the 103 households surveyed, 31% of the respondents had no comment when asked if there was anything they would like to convey to policymakers about water quality. Of these respondents, 65% do not test their water, whereas only 31% do test their drinking water. Conversely, over half of the respondents (56%) filter their water and 44% do not.

Upon reviewing the data, I wondered if homeownership was a factor that could influence people's perception of their water quality. Of those respondents who felt their drinking water should be tested, the majority own their home (89%). In comparison, 87% of all respondents own their home. All of the respondents who were either satisfied or not concerned about the quality of their drinking water own their homes. There were simply not enough respondents who rent their homes out of the total sample to determine if homeownership is a factor. Nevertheless, this is still an avenue worth pursuing in future research.

Out of the 103 households surveyed, 28% of the respondents' household income was less than $47,000 per year, and 70% of the respondents' household income was greater than $47,000. According to the survey the data have been drawn from, $47,000 is the average household income per year in Kent County, Michigan. Based on these data, it appears that income level is not positively correlated with the respondents' perceptions of their water quality.

The majority of the respondents who felt testing and increased concern for water quality were important have at least some college and above. Of the respondents who had no comment or left the response blank, all have a high school diploma while the majority have some college and above. All of the respondents who were satisfied with the quality of their drinking water have some college and above. Based on these data, it appears that education level is not a factor that influences people's perceptions of their drinking water quality.

Summary and Conclusions

The second and third hypotheses introduced earlier are not supported by the data. My second hypothesis was that overall, households would be satisfied with the quality of their drinking water. After analyzing the data, this hypothesis was not supported. Furthermore, I was surprised by the number of people with no comment concerning their drinking water. The third hypothesis was that the perception of water quality is positively correlated with homeowner educational and household income. This hypothesis was not supported by the data because almost all of the respondents have the same educational level—the majority answered "some college" and above. Household income per year also did not have an influence on people's perceptions of their water quality. It would have helped if the income in the survey was displayed as ranges instead of "less than" or "greater than" $47,000 because it could give a better indication of socioeconomic status.

The results of people's awareness and knowledge of water quality issues may be different if the questions were tailored more specifically for this study. For example, instead of asking about the institutions that are helpful in alerting people to problems in their area, the question should ask the respondents if they know of institutions that are helpful in alerting them to water quality problems/issues in their area. There were a number of bizarre responses to the original question in the survey. For example, several respondents suggested their school newsletter is helpful in educating them about problems in their area. One respondent wrote "Grand Valley," and another suggested Fox News as sources of education. The variability of responses may have been due to the nature of the question—because it was so open for interpretation and did not specifically address the problems about water.

Overall, there is a lack of education concerning drinking water quality. Out of the 68 respondents who expressed a need for water testing and increased concern for water quality in addition to those who did not have a response, a total of 41 households do not filter their drinking water. In an effort to increase awareness and knowledge of safe drinking water, we need to adjust how people are being presented with the information along with its contents. Local and state agencies need to promote strategies to improve drinking water.

Information about drinking water quality needs to be better circulated to the masses, for example, by publishing the findings in township newsletters or distributing informational pamphlets to every household in each city. While I was reviewing the surveys, a number of bizarre responses came to my attention. Respondents were asked to list the institution(s) that are helpful in informing them of problems in their area. A number of respondents cited their school newsletter as a source of information concerning their community. Even though the suggestion from the survey initially seemed odd, it may be a good indication of where people do expect to find information. Therefore, the lesser thought of forums, such as school newsletters, may be a good way to provide water quality data. In any case, these sources of information should also include regional and national data so that they can all be compared. In addition, agencies should also mail out "reminder" flyers to households, reminding them to have their drinking water tested, and what agencies/alternative methods are available to conduct the tests at affordable prices. This information needs to be easily accessible to the public. Moreover, to improve public outreach, I would recommend additional education about the agencies that test for water.

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About the TRiO Programs

To fight the war on poverty, our nation made a commitment to provide education for all Americans, regardless of background or economic circumstances. In support of this commitment, Congress established several programs in 1965 to help those from low-income backgrounds and families with no previous college graduates (first generation). The first three programs established were Talent Search, Upward Bound, and Student Support Services. Thus, they are known as the TRiO Programs.

Since then, other programs have been added, including Upward Bound Math and Science, Educational Opportunity Center, The Training Authority, and in 1989, The Ronald E. McNair Post-Baccalaureate Achievement Program. The goal of all of the programs is to provide educational opportunity for all.

The Ronald E. McNair Post-Baccalaureate Achievement Program is designed to prepare highly talented undergraduates to pursue doctoral degrees. In addition, the goal is to increase the number of students from low-income backgrounds, first generation college students, and under-represented minorities on college and university faculties.

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