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Authors
**BIOGRAPHY OF**

**DR. RONALD E. MCNAIR**

**HE OVERCAME OBSTACLES.**
Dr. Ronald Erwin McNair, Physicist & Astronaut, dared to dream. As an African-American growing up in a poor community in the South, he encountered discrimination early in his youth. Yet this did not stop him from pursuing his dream of becoming a scientist.

**HE ACHIEVED ACADEMIC EXCELLENCE.**
In 1971, he graduated magna cum laude from North Carolina A&T State University with a B.S. degree in physics. Ronald McNair then enrolled in the Massachusetts Institute of Technology. In 1976, at the age of 26, he earned his Ph.D. degree in laser physics.

**HE BECAME A LEADER IN HIS FIELD.**
Dr. 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 shuttle Challenger.

**HE WAS RESPECTED AND COMMENDED.**
For his achievements, Ronald McNair received three honorary doctorate degrees and many fellowships and commendations. These distinctions include: Presidential Scholar, 1967-71; Ford Foundation Fellow, 1971-74; National Fellowship Fund Fellow, 1974-75, Omega Psi Phi Scholar of the Year, 1975; Distinguished National Scientist, National Society of Black Professional Engineers, 1979; and the Friend of Freedom Award, 1981.

**HE EXCELLED IN MANY ASPECTS OF LIFE.**
Ronald McNair also held a fifth degree black belt in karate and was an accomplished jazz saxophonist. He was married and was the dedicated father of a daughter and a son.

After his death in the Challenger explosion in January 1986, members of Congress provided funding for the Ronald E. McNair Post-Baccalaureate Achievement Program to encourage college students with similar backgrounds to Dr. McNair to enroll in graduate studies. Thus, the program targets students of color and low-income, first-generation college students. This program is dedicated to the high standards of achievement inspired by Dr. McNair's life.
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I hope you will enjoy reading the sixth edition of the UNLV McNair Scholars Journal. This journal exemplifies the quality and rigor of scholarly research conducted by our undergraduate students in the McNair Scholars program and reflects the mentoring and commitment to student success provided by our outstanding and dedicated faculty. Each article represents countless hours of research, experimentation, and analysis; the authors are the intuitive and discerning students who we anticipate will be at the top of their respective fields in the future.

The UNLV McNair Scholars Institute provides a unique opportunity for several of the most talented undergraduate students at UNLV to work with some of our extraordinary faculty in order to learn about how to design, implement, and report research. During this process students are provided with a foundation for conducting research that will hopefully stimulate a desire for continuing their education with graduate studies and lead them on a path towards becoming a future professor. This student and faculty collaboration characterizes the interactive and rewarding learning experiences available to our students.

We are honored to have these talented students and dedicated faculty at our university and we are proud to share this publication as a testament to their outstanding work. The research reported in this journal exemplifies the scholarly studies conducted by our undergraduate students and reflects the quality of mentoring and commitment to student success provided by our outstanding and dedicated faculty.

Neal J. Smatresk
President
The UNLV McNair Scholars Program personifies the mission of our Division of Student Affairs. Our mission is to provide quality services and programs that create educational opportunities, foster collegiate success, enhance continuous learning and promote a just and inclusive campus.

Within a broader context, UNLV seeks to create a campus environment that promotes the performance of superior research and scholarly endeavors at all levels of study. A unique framework to engage under-represented undergraduate and graduate students in exciting and enriching research opportunities is provided by the McNair Scholars Program. This sixth publication of UNLV’s McNair Scholars Journal is an affirmation and amplification of those endeavors and accomplishments.

Perhaps the most important aspect of the McNair Scholars Program is that of relationship between the faculty mentor and scholar. For the scholar, the benefit of participating in the program depends to a large extent on this relationship. The relationship is designed to encourage, motivate and prepare McNair scholars for doctoral studies. Based on the research reported in this journal, the program has been a resounding success. It provides an undeniable testament to the hard work and commitment of the students and their faculty mentors.

I extend my sincere commendations and congratulations to the McNair scholars, faculty mentors, program staff, and the Center for Academic Enrichment and Outreach for a job well done. This edition of the UNLV McNair Scholars Journal is a fine tribute to their success.
This sixth publication of UNLV’s McNair Scholars Journal is the culmination of extremely hard work by many talented and dedicated individuals. The triumphs of the McNair Scholars and the commitment of their faculty mentors are highlighted within these pages and are exemplary examples of the academic excellence at UNLV.

Over 30 years ago I began my career in higher education, working with high school and college officials to attract young minority students towards postsecondary education. At the time, few universities employed faculty members who could personally identify with the economic and/or social backgrounds of disadvantaged students. There was an urgent need to diversify the ranks of college faculty in order to create academic environments where nontraditional and under-represented students could succeed.

To meet this need, the U.S. Department of Education established the Ronald E. McNair Post Baccalaureate Program. Named for one of the astronauts who perished in the 1986 Challenger explosion, the McNair Program sought to prepare a cadre of under-represented college students to become university professors and role models for others from similar backgrounds. Since its inception, McNair has become the most prestigious federal education program, helping to diversify the faculties at universities and colleges across the country. It is an honor for the Center for Academic Enrichment and Outreach to host UNLV’s McNair Program.

I commend the McNair scholars and their mentors for their hard work and dedication. These scholars displayed outstanding academic excellence in conducting their research; I have no doubt they will develop into topnotch educators. I also applaud President Neal Smatresk, Vice President Juanita Fain, Deputy Executive Director Keith Rogers, the Graduate College, and many other university units for their resolute support of the McNair Program. This journal, displaying the fruit of the McNair Scholars toil, reinforces our legacy and continues a tradition of excellence for future scholars.
It gives me immense pride to recognize the inimitable research profiled in the sixth UNLV McNair Scholars Institute Journal. Each year scholars are challenged to participate in research that is relevant, engaging, unique and consistent with their interests while under the careful watch of a faculty mentor. The broad scope of research topics and quality of articles always exceed expectations; this year’s journal publication is no exception.

UNLV operates one of 200 prestigious McNair programs designed to increase attainment of Ph.D. degrees by students from under-represented groups. Since receiving the Ronald E. McNair Post-Baccalaureate Achievement Program in 1999, UNLV has assisted over 250 talented undergraduate students who have demonstrated strong academic potential and has provided them an opportunity to conduct research and participate in other scholarly activities.

This publication reflects not only the dedication and hard work that resulted in the research journal presented here, but also the extraordinary support and expertise offered by the faculty mentors. I congratulate the McNair Scholars, applaud all participating faculty, and extend my sincere appreciation to the Graduate College and UNLV’s leadership for supporting and encouraging the outstanding accomplishments of our students.
McNAIR STAFF

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2011 McNair Scholar Articles
SUBJECTIVE EVALUATIONS OF DATA CHECKING TECHNIQUES

BY CYNDY ANANG

ABSTRACT
The aim of this research was to analyze people’s subjective opinions about the data checking techniques double entry, visual checking, and read aloud. Previous research has shown that entering data twice is more effective in reducing the data entry errors. We therefore hypothesize that participants would perceive the double entry technique as most accurate and reliable. Forty-eight undergraduate students answered a set of 16 items which was used to gather participants’ opinions on the three techniques. The results showed that the double entry technique was perceived as significantly more accurate ($F(2, 47) = 5.754, p = .006$) and reliable ($F(2, 47) = 7.91, p = .001$). No other technique received better ratings than double entry on any of the other items. Based on our results and the information found by previous research, we recommend that researchers use the double entry technique to check data.

INTRODUCTION
The purpose of this research was to distinguish between double entry, visual checking, and read aloud data checking techniques by considering people’s opinions about each one. In general, these three data checking techniques are used to ensure that errors found in data are reduced drastically so that in the long-run results based on the data used are as accurate as possible.

Several data-checking techniques are commonly used to detect errors and correct them. This paper will focus on three data-checking techniques: double entry, visual checking, and read aloud. In the double entry technique, the user enters the data a second time, and the computer compares the two data entries. If there is a difference between the two data entries, the user corrects the error. The visual checking technique involves the user visually comparing the data on the paper data sheet with the entries on the computer screen and correcting any errors found. For the read aloud technique, another person reads the data aloud from the paper data sheet, and the user visually checks the data on the computer, correcting any errors found.

This research in particular is important for two reasons. First, if data-checking techniques are equally effective, we can recommend the one that is preferred. Second, it allows us to determine the strengths and weaknesses of each technique. This
allows us to modify the techniques, so that we can make them more user-friendly.

LITERATURE REVIEW
Research data assists in examining many issues in life, and helps determine whether certain hypotheses are correct. When data is not correct, our conclusions can be affected drastically (Burchinal & Neebe, 2006). With just one data entry error, a significant t-test or correlation can be made non-significant (Barchard, Scott, Weintraub, & Pace, 2008). Therefore, it is imperative that we check data in the most efficient way possible.

For a data checking technique to be the most efficient, it needs to be both accurate and user-friendly. A particular technique may be ignored because of the discomfort it causes the user, even if that technique is the most effective in reducing errors. If researchers do not like or do not have faith in a certain technique, then they probably will not use it. Therefore, it is important to consider what people think about the techniques, so that we understand what they prefer and what they do not prefer.

Some researchers have compared these three techniques, to determine which is most effective. When the techniques double entry, read aloud, and visual checking have been compared, the double entry technique has consistently been found to be more accurate than the other two techniques (Barchard, Pace, & Burns, 2009; Barchard et al., 2008). Medical research that used small samples also found double entry to be more efficient than visual checking (Kawado, Hinotsu, Matsuyama, Yamaguchi, Hashimoto, & Ohashi, 2003). However, research has also shown that the double entry technique is the most tiring technique (Beaty, 1999).

Among the three techniques being discussed, the visual checking technique results in more errors than the double entry and read aloud techniques (Verenikina, Anang, Jenkin, Grob, & Barchard, 2012; Scott, Thompson, Wright-Thomas, Xu, & Barchard, 2008). In fact, visual checking doesn’t even reduce more errors than single entry (Barchard et al., 2008) which takes place when researchers enter data a single time, without checking the data afterwards to make sure it is correct. This means that visual checking isn’t even worth using, and may waste time and resources. Unlike the other two data checking techniques, the read aloud technique involves two people, for example, the administrator and the participant. When two people check data, the process is more effective because it allows users to detect errors that may be missed by a single person (Nihei, Terashima, Suzuki, & Morikawa, 2002). It also helps eliminate boredom and mental fatigue because the work load is shared by two people. When users are bored or experience mental fatigue during data checking, there is a chance that more errors may be ignored (Kole, Healy, & Bourne, 2008).

Even though double entry is most efficient at checking data, and visual checking is the worst, data checking still isn’t easy; no matter what technique someone uses. When people look at data on a computer for long amounts of time, they can be affected in one of two ways. They may either perfect the art of data checking, or they may become bored and tired (Healy, Kole, Buck-Gengler, & Bourne, 2004). Because data checking is already challenging enough, it is important that we consider people’s opinions about the techniques. Considering people’s opinions will help with choosing the data checking technique that will suit each person.

In this research, we have considered people’s opinions about the three data checking techniques double entry, visual checking, and read aloud. Our hypotheses, which stem from both previous research and our experiences with data checking are as follows. We hypothesize that participants who use the double entry technique would perceive the technique as the most accurate and reliable.

METHODOLOGY
Participants
A total of 48 participants (26 females and 22 males) participated in this study for course credit. Their ages ranged from 18 to 39 (mean 22, standard deviation 5.26). The participants included African American (12.50%), Asian (22.92%), Caucasian (41.67%), Hispanic (14.58%), Pacific Islander (6.25%), and Other (2.08%).

Measures
This study used a self-report questionnaire that includes 16 items. Each of the items is measured on a 5-point Likert scale, which ranges from (1) “Strongly Disagree” to (5) “Strongly Agree”. See Figure 1
PROCEDURE
The participants used the computer for the entire study. First, they watched a video that explained how to use Excel. Second, they were randomly assigned to a technique. They did not know that there were other data checking techniques involved in the research. They only learned about the one that they were assigned. Third, they watched a video that explained how to use the particular technique. The participants were then given a set of data so they could practice their assigned technique. This set included five fake participants. After this, the participants checked data from twenty fake participants. Finally, after they completed checking the data, the participants were asked to complete the subjective evaluation of the technique they used. This evaluation took two to five minutes. See Figure 1.

Data Analysis
We performed a one-way Analysis of Variance (ANOVA). Our dependent variables were the 16 items from the evaluation form. Our independent variable was the group to which participants were assigned. This variable had three levels: double entry, visual checking, and read aloud.

RESULTS
Participants rated double entry as significantly more accurate ($F (2, 47) = 5.734, p = .006$) and more reliable ($F (2, 47) = 7.91, p = .001$) than the other techniques. No other differences were significant. See Table 1

It is interesting to note how each technique was described. Participants rated the double entry technique as satisfying and depressing, in addition to describing it as accurate and reliable. The read aloud technique was rated as painful and depressing. For the visual checking technique, none of the average ratings exceeded 4 on the 5-point scale.

DISCUSSION
In this paper, we have examined what the participants thought about each data checking technique. While there wasn’t much significance in the difference in opinions between the three data checking techniques, it is still important to discuss the techniques’ trends in ratings. We believe that these trends may become significant with a larger sample size.

Double entry was rated as significantly more accurate and reliable than visual checking and read aloud. This result relates to previous research, as double entry has been shown to be the most accurate of the three techniques (Barchard, Pace, & Burns, 2009; Barchard et al., 2008). In data checking, accuracy is very important. Therefore if a technique is perceived to be most accurate when being used for data checking, it is important that the technique is chosen over other techniques that are not perceived as most accurate. This means that even though the double entry technique is a lengthy technique because participants have to enter all of
the data a second time and correct all errors on both sides, it is advisable to use the double entry technique instead of the visual checking or the read aloud techniques.

Double entry was also described as satisfying and depressing. Participants may have rated this technique as satisfying because much effort is put into ensuring that errors are eliminated by checking the data a second time. However, because data has to be checked a second time, the double entry may be considered as depressing because it involves so much time and energy.

Visual checking had the highest average ratings for fun, enjoyable, and pleasant. These ratings for visual checking may be because this technique takes less time and therefore is less stressful to use. However, these differences were not significant, and none of these average ratings was more than 4 on the 5 point scale.

Read aloud was rated as most painful and depressing. Some possible reasons why this technique had been rated as painful may be because of the speed at which the administrator was reading the items to the participant and how fast the participant was able to type the items. It could also be more frustrating and painful for individuals who do not enjoy interacting with others, or who prefer to work alone.

Our findings support the hypothesis which was that participants would perceive double entry as most accurate and reliable. Unlike the other two techniques, the chance of errors being detected is higher when using the double entry technique because the double entry technique compares two data sets and errors are highlighted for users to correct them. Participants also spend a lot more time on checking data when using the double entry technique because the double entry technique requires that data is entered a second time. Spending more time checking errors for a data set may help reduce the number of errors.

Based on our findings and results shown by previous research, we recommend the double entry technique for data checking. Our sample showed that most participants found the double entry technique to be the most accurate and reliable. It is very important that the participants are confident in these two factors. This is because if people do not think that the technique being used is efficient at data checking, then there is no point in using the technique since the main purpose of using data checking techniques in the first place is to ensure that errors are reduced or better yet completely eliminated. Specifically, why would researchers go through the trouble of checking data, when they do not have confidence in the technique being used? There would be no point of checking the data in this case, because resources (time and people) would be wasted for no sufficient reason.

**LIMITATIONS OF THE STUDY**

The sample used for the study was a limitation in this research. The participants who completed the study were mainly young undergraduate students and may not have ever used any of the three data checking techniques.
checking techniques: double entry, read aloud and visual checking. They may not be involved in any research and may not care about the importance of data or data checking. Also, there is a chance that some of these participants may not have had enough computer training before participating in the study. This may affect how they feel about the process of data checking, particularly because the entire study is conducted using a computer. Another issue that may affect the results of the study is that the undergraduates take part in the study for only 1.5 credits. Even though some students may need the credits, others may not be that motivated to put forth much effort for credits. Specifically, students are not invested in research, and do not gain anything from ensuring the data is correct.

**FUTURE RESEARCH**

Future research should explore whether age makes a difference in preference of data checking techniques. There has been research on different age groups, to determine if there are differences in rate and accuracy of data entering. People who are older (60-75 years) tend to complete fewer tasks, are slower at completing these tasks, and attain fewer skills after practicing than those who are younger (20-59 years) (Czaja & Sharit, 1998). Because older people complete tasks slower, they may prefer data checking techniques that are fast and easy; instead of ones that are more time consuming. Also, because they attain fewer skills after practicing, they may prefer a technique that is easier to learn. So, they may prefer a technique such as read aloud, even though double entry has been shown to be the most effective (Barchard, Pace, & Burns, 2009). Therefore, it is very important to consider everyone’s opinions about data checking, whether young or old. This will enable everyone to check data in the most efficient way.

Also, because our research was done using undergraduate students who received credits for participating in the study, there was a chance that these undergraduate students were not as interested in the study as actual researchers because they are not involved in the research being conducted. There are two things that future research can do to achieve better results. First, these students could be compensated with better rewards than simply receiving credits. This might help ensure that the undergraduates who take part in the study are more motivated to invest their time and energy into the study. Second, when possible, the study should be conducted using subjective opinions from actual researchers. That way, the opinions will not be from people who do little to none of data checking by themselves. Instead, it will be from researchers who actually care about their study, and who will most likely do whatever it takes to ensure that their research excels and is beneficial to others.

Participants who hardly use Excel or have never used Excel may have problems taking part in this study because the whole study was done by using a computer. This may influence how they rate whichever technique they are randomly assigned. Future research may have to find a more suitable way to administer this study to such participants so that their ratings will not be affected.

Also, even though the participants are shown a video of how to use the Excel sheet and how to use the randomly assigned technique, participants may have a difficult time learning these new skills and effectively using them within the short period that the study is conducted. Therefore it is encouraged that future research would allow participants to have more time to adapt to these skills before actually taking part in the study. The study can therefore be administered in two parts where participants learn the new skills during the first session on a different occasion and get the chance to practice over a longer period of time before finally administering the study on another occasion. That way, it is ensured that all participants have the adequate skills to participate in the study conducted.

The research we have conducted helps us understand how students feel about the particular data checking techniques. However, we do not know what the participants consider to be the most important attribute of data checking techniques. What would make them truly want to use a certain technique? For example, maybe one person finds accuracy to be the most important trait of a data checking technique, while another person thinks it’s critical for the technique to be comfortable. Further, if people want an accurate technique, then they will choose the most accurate, or double entry. If we ask participants which trait they find most important, then we will find which technique would most likely be used.
Also, we could incorporate feedback from participants so that features of a particular technique that are preferred can be added to previous features of any technique so that the improved technique will become more appealing to the user. For example, if most people prefer comfort when using data checking techniques, then we could try and make double entry more comfortable. These opinions would give us some direction into improving the data checking techniques, so that people will use them more often.

Also, with our research, each participant only checked data using one technique. Another way the study could be done in the future is to have participants each check the data for all three techniques. It is possible that the participants would think differently of the techniques if they had something with which to compare them. For example, the participants may better understand that data checking is never going to be that enjoyable, and that one technique is much more enjoyable than the other two. They may also realize that one of them seems to be the most accurate, or the most comfortable, etc. However, they would probably not be able to realize this by only being shown one technique. By conducting the research in this way, we may be able to get a better sense of participants’ preferences for data checking techniques.

CONCLUSION

Our study examined the subjective evaluation of participants who used the three data checking techniques double entry, read aloud and visual checking to correct errors in a data set. Based on the data we collected and analyzed, we concluded that the double entry technique is perceived to be the most accurate and reliable. These are the only significant results. However, data collection is ongoing and we expect additional differences between the techniques to emerge once we have a larger sample size. Because of our results and what past research has found, we recommend that researchers use the double entry technique to check data.

REFERENCES


ABSTRACT
Dust and soil surfaces contain terrestrial radionuclides that occur naturally in the earth’s crust. However, the level of activity differs by soil type, particle size and geographic location. Some radionuclides are more abundant in one soil type but less concentrated in others. This research paper looked at the radioactivity levels of dust and soil samples based on particle size. The samples were measured in vial sample holders using HPGe Germanium detector for a period of five days each. Background radiation was counted for the same amount of days and subtracted to eliminate any counting statistical errors. The results showed that there is no significant correlation between particle size and radioactivity concentration levels. However, the amount of activity found in the samples depends on the type of radionuclide abundant in that sample. Potassium-40 has the highest activity level in all samples whereas Cs-137 has the lowest amount. This may be due to the fact that Cesium-137 is not a naturally occurring radionuclide. The small amounts of activity present were due to fallout from atmospheric weapons tests conducted at nearby test site. However, these activity levels are so low there are no health risks to be concerned with.

INTRODUCTION
The purpose of this research project was to continue the ongoing analysis and characterization of soil and dust samples, collected at Nellis Dunes Recreation Area (NDRA), located about 15 miles North-East of Las Vegas, in terms of their mineral, chemical and radionuclide content by different research groups. This project will measure dust samples using a gamma detector to determine their absolute radioactivity. The results will be compared to national standards in terms of radioactivity levels. If the activity levels found in these samples are found to be above national standards by a higher percentage, then this would cause an alarm. However, it is not expected to see the results of this research surpass the national standard levels.

It is common to detect radioactivity in soil or dust samples. Most of this comes from naturally occurring radionuclides such as Uranium or Thorium and its decay products. There are a quite number of
radionuclides present in soil samples, such as Actinium-228, Lead-212 and Bismuth-212 (Sudowe et al, 2009).

Determining the radioactivity level of the samples will be more valuable if the relative activities can be correlated with sample size and texture. For example, arsenic concentrations are found to be slightly higher in dust samples than in soil samples since the dust samples have a finer texture (Debbie Soukup et al, 2009). This study will apply a similar approach and compare the radionuclide concentrations in dust samples to that of soil. The absolute activities of dust samples of various sizes will be a valuable evaluation of how sample particle size affects concentration levels.

LITERATURE REVIEW

This project is a continuation of previous and recent studies on the mineralogical, chemical and radionuclide characteristics of soil and dust samples from Nellis Dunes Recreational Area (NDRA). The area is a 36 km square open landscape used for Off-Road Vehicle Driving (ORV) and managed by the Bureau of Land Management. It is located about 15 miles North East of Las Vegas. As the only recognized area that is legally accessible for off-road vehicle driving, it has become a regular destination for people of Southern Nevada interested in using it for recreational purposes.

Since air quality has become a major priority for the residence of Southern Nevada, the control and prevention of air pollutants such as dust is a top priority for local officials. Dust emission, according to a recent study, is a major source of air pollution that can lead to serious health problems such as asthma, dementia, and even in serious cases cancer. The presence of some dry lakes surrounding the city and the sand dunes at NDRA provide an opportunity for dust emission to occur either naturally or by human activities. This creation of dust particles in air is a major concern because particular matter in the form of dust particles can enter the lung parenchyma causing significant cardiovascular and respiratory damages, such as lung cancer (Ali S. Kamal et al., 2011; Fattore et al., 2011).

The dust particles used in this study range from less than 2um to less than 10um. If the particular matter were greater than 10um, they are not likely to enter the lung airways due to their larger size. It has been elucidated that particle size and texture are important factors in the elemental and chemical composition of the soil, as well as the degree of health effects due to exposure. A study conducted by researchers show a correlation between particle size and particular matter composition. Higher elemental concentrations were found in PM2.5 (Osormas-Vegas et al., 2011). The Environmental Protection Agency (EPA) describes PM2.5 as particular matter that is 2.5 micrometers in diameter and smaller. It is determined that acute cardiovascular changes, such as increase heart rate, can be caused by ambient PM2.5 exposure (Kamal et al., 2011). The different constituents of air pollution were compared and it was found that PM2.5 “had the highest health impact on the 24,000 inhabitants of the two small towns” surveyed under the study (Fattore et al., 2011). Particular matter emission causes about a total mortality of 8 out of 177 in a year, whereas other pollutants such as ozone and nitrogen dioxide only cause 3 mortalities (Fattore et al., 2011).

A similar study conducted by researchers at UNLV concluded that the mineralogical composition of soil and dust samples illustrates elevated Arsenic concentrations in dust compared to soil samples. Arsenic concentrations are higher in small particle samples with an elevated range of 0.419ug/g to 1344.6ug/g which is well above the EPA’s SL level of Arsenic in residential soil which is about 0.39ug/g (Soukup et al., 2009).

A similar study found that there is high mineral concentration of “smectite” and “palygorskite” in smaller soil particles that are less than 2um or between 2um-20um (Soukep et al., 2009). These minerals, according to studies have significant health effects and can lead to lung cancer. The natural mineral “polygorskite” is similar to asbestos, an element associated with causing lung cancer.

Sometimes health effects associated with exposure to dust particles would be assumed to correlate more with the quantity inhaled rather than the size and texture of the particles. However, according to a recent study, particle size can greatly determine the nature and severity of health effects associated with dust inhalation. The study found that PM10 samples strongly relates to hemolysis and DNA degradation effects seen after exposure to dust particles. On the other hand, PM2.5 particles are known to cause more “inhibition of cell proliferation” among the mice exposure to the samples (Osormia-Vegas et al, 2011). Dust particles with an average size of 2.2-5.2 um are
more likely to cause a decrease in the systemic immune function of mice cells after sufficient time of exposure, according to a study. There was a significant decrease in the \textquotedblleft IgM antibody plague forming cell (PFC)\textquotedblright{} response in mice after exposure to dust samples of finer texture (Keil et al, 2009). This means that smaller particles were likely to cause significant health effects relatively.

In the radionuclide analysis of the samples, researchers were able to identify the presence of some naturally occurring isotopes as well as one that is artificially made. This is Cs-137 that was found in all samples except one (Sudowe et al, 2009). The presences of other radionuclides include Actinium-228, Lead-212, and Bi-212 which are all thorium decay products. The main natural uranium, Uranium-235 and its daughter products, Protactinium-234m, Lead-214, Bi-214 were found in most of the samples (Sudowe et al, 2009). The specific activities of naturally occurring radionuclides may vary from site to site. Since different sites may have different surface layers, the radionuclide content in terms of activity per gram may indicate some variance. This is proved by a study that shows that the specific activity of naturally occurring radionuclides such as Ra-226, Th-232, and K-40 "vary significantly by site and area" (Lee et al 2011). The specific activity of naturally occurring radionuclides is slightly higher in the Keum River area than the Chinese desert area.

This project is using samples from different sites with different surface layers. It would be interesting to determine if the areas with more sandy soil would indicate a higher specific activity than samples collected in clay/silt areas. Hence off-road driving trail on sandy soils produce less PM10 than trails in silt/clay trails (Goosen and Buck, 2009). If this is the case, then finding a greater than usual amount of specific activity in the silt/clay samples will be a cause of alarm since there is a likelihood of more dust being created and a larger quantity inhaled.

A similar study was conducted in analyzing dust samples for radionuclide characteristics. However, the research was centered on how to utilize the best geometry to measure dust samples for radionuclides. A petri dish and a vial were used as sample holders. The net peak area per gram of the samples was determined for both sample holders and computed on a histogram. The results show a higher net peak area per gram for the vial than the petri-dish. It was concluded that the best way to measure dust samples for radionuclide analysis in a detector is using a vial. The vial sample holder has a better counting geometry that makes it more efficient than the petri-dish. This project will make use of this finding and count all the samples using the vial. Since the detector well has similar dimension as the vial, it is predicted that a more accurate measurement will be determined.

This project is a continuation of the previous finding and by using such geometry the analytical frame will be broader and more accurate.

**SUMMARY OF LITERATURE REVIEW**

There have been numerous researches on the analysis and characterization of dust samples in terms of their elemental, mineral and radionuclide characteristics. Since dust is considered a major air pollutant, the analysis of dust for environmental health impacts has gauge in different horizons to better understand the causes and effects of dust emission. Also since dust is a component of soil it would be imperative to compare the activity levels to better determine risk factors. The size and composition of dust samples are major factors in determining health related-effects and because of this there has been more emphasis on this criterion of studying dust samples.

**METHODOLOGY**

Four different dust samples are used in this experiment. The different dust samples have been characterized based on size and type of surface soil. The samples were collected based on a mapping design created to better utilize appropriate scientific methods. About 17 different mapping areas were created and labeled numerically based on sample type. Sand and sand-affected areas are labeled from 1.1 to 1.5 depending on the degree of rock fragments, surface crust and amount of vegetation. Silt/clay areas are labeled 2.1 to 2.3, rock-covered areas are labeled from 3.1 to 3.5 and finally drainage areas are labeled 4.1 to 4.3 (McLaurin et al, in review).

The samples in this survey are categorized from site 2.2-3, 5.2, 2.2-1, and 5.1. The dusts collect in this area were in the silt/clay areas and the rock-covered areas. The samples were finely crushed to get rid of large particles. The samples were then individually carefully weighed and placed in vial sample holders. Each of the individual samples was measured for five consecutive days. Background was also assayed for five consecutive days to clear any form of background activity from the results.
The samples were measured using a Canberra Model GR3519 high-purity germanium gamma detector with a relative efficiency of 35%. Energy calibration was done using a certified soil reference standard in vial sample holder geometry. The calibration was done with reference to ANSI Standard N42.14-1999.

Calibration and efficiency processing was performed using the Eckert & Ziegler analytics Standard Radionuclide Source with Lot no. 84912-602. The calibration was done using an HPGe-High Purity Gamma-Ray Spectrometer with an efficiency of 35%. All calibration methods were done in compliance with ANSI N42.22-1995.

The mean activities of the various radionuclides were expressed in picocuries per samples and the specific activities were analyzed in Bq/g. The results were then analyzed using bar charts to differentiate the activity levels of the varying samples sizes and textures.

Figure 1 Mapping area of NDRA (McLaurin et al, in review)

RESULTS

The results indicate no correlation between sample size and radioactivity level. With the activity levels of the different sample sizes graphed on a bar chart, it shows differentiation in activity levels varies more with the type of radionuclide than seen in size variance. For example Potassium-40 activities are slightly higher in all samples analyzed than other radionuclides such as Cs-137. The radioisotope Pa-234m has high concentrations in Dust 2.2-1 whereas the activity levels in Dust 3.1 are high in Potassium-40. The activity levels of Potassium-40 are higher in soil samples than dust samples. All other radionuclides have very low activity levels in dust compared to soil samples. The relative activity levels of the soil samples are random and do not correlate with the size of the particles. The differentiation in activity levels is more related to type of radionuclide than sample size in both dust and soil samples. However, due to the low activity levels found in these samples, there is little concern for significant health risks.

Figure 3: Comparing absolute activities of different dust samples
CONCLUSION

From the analyses of the results, it can be concluded that there is a slight difference in activity levels of dust or soil samples of various sizes. However, the level of activity concentrated in one sample does not correlate with the particle size of the sample but rather the radionuclide content of the sample. Potassium-40 has the highest amount of activity in all samples. The activity levels of all the dust or soil samples are so minimal they are considered low-risk in terms of health effects. Further research in the spatial and temporal radioactivity levels of the dust or soil samples will serve as a gauging tool to safeguard potential risk factors.

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CHILDREN’S EMOTIONAL STATE AND FALSE MEMORY IN THE DRM PARADIGM

BY PAMELA CORNEJO

ABSTRACT
Children are called to give testimony for highly emotional experiences during court cases. Research indicates that children in a negative emotional state recall with lesser vividness (Berliner et al. 2003) and are more likely to incorporate false information (Levine, Burgess & Laney, 2008). The present study will examine this further by examining the influence of negative and positive emotional states on recall and recognition in child-normed lists within the Deese-Roediger-McDermott (DRM) paradigm. The DRM paradigm is a cognitive task that relies on gist memory for remembrance of the critical lure in semantically associated word lists. It is expected that the eight year old children in a negative emotional state will have greater occurrences of false memory than the five year old children in either emotional state and eight year old children in a positive emotional state. Implications for the results will indicate that child eye witnesses may attempt to accommodate during testimony by assenting to leading questions or elaborating the details of event to fill in the gaps of a traumatic memory.

INTRODUCTION
Memories serve as a reference for past experience. They are vulnerable to alteration or exclusion of details, and this may increase as time passes between the event and time of recall. When the accuracy of a memory is altered through adornments or omissions, it is considered a false memory (Reyna & Lloyd, 1997). False memory is of particular concern during the court process due to the importance of eye witness testimony. Both adults and children are vulnerable to incorporation of misinformation, gathered before, during or after interviews. An eye witness often retells an event multiple times, increasing the potential for adaptation. One particular area regarding children and their memories that has been researched is court cases, such as sexual abuse. Because of the lack of other witnesses, sexual abuse cases rely heavily on child witnesses as the only resource available for testimony (Cederborg, 2004). Recalling sensitive and emotionally intensive events may give rise to a negative emotional state such as shame or sadness. Studying the influence of
sadness and happiness may offer assistance in identifying potentiality of vulnerability to external factors during testimony.

The current study intends to use emotional state and age as mediators for false memory. First, this paper will consider how children's emotions can influence memory and then review how false memories are formed, particularly in relation to children. Then, this paper will consider how the two factors influence false recall and recognition of child-normed lists. An experiment will be proposed that examines these factors and predicts that children, especially older children, in negative emotional states will show an increase of false memories in the DRM paradigm. Finally, legal implications of the proposed results will be addressed.

Emotional State and Child Memory

In some court cases, child witnesses are called to testify for memories that involve events of high emotion. Previous research has shown conflicting findings in regards to the influence of emotional state on suggestibility of memory recall. Some studies have found that low suggestibility is associated with high emotional states and others have found low suggestibility associated with low emotional states (Bruck & Melnyk, 2004). All but two of the studies described by Bruck and Melnyk (2004) used varying medical procedures as the targeted event which may have attributed to the conflicting results. The emotional charge of a memory could impact the accuracy of recall because of the cognitive associations that emotions carry. Because emotion develops through the accomplishment or inability to accomplish a desire (Levine, Burgess, & Laney, 2008), if the emotion is negative then a child may feel incompetent or helpless. In contrast, if the emotion is positive then the child may have a sense of confidence because happiness has been found to be associated with feelings of self worth and satisfaction (Levine, Burgess, & Laney, 2008). Memories that are recalled in a state of happiness may have greater stability and resistance to misleading information due to an increased sense of confidence.

It could then be expected that memories associated with sadness will have the opposite results; in particular, it may be reasonable to expect that children in a sad state will be more vulnerable to suggestibility. Levine, Burgess and Laney (2008) found that with ages four and six, sad children were more likely to incorporate misinformation during an interview than happy children. In Berliner, Hyman, Thomas, and Fitzgerald’s (2003) study, lesser vividness was found for traumatic memories than positive emotion memories. Children in this study, who were receiving treatment for a history of trauma (e.g. sexual assault), rated traumatic memories as having lesser vividness than positive emotion memories. The decreased vividness for negative emotion events may come from a coping strategy in which forgetting about an event will decrease injury to self concept (Berliner et al., 2005). When in court, children may feel incompetent in regards to questions about the specifics of their traumatic experience and may attempt to fill in the gaps with elaboration or by assenting to false information. Finally, it should be noted that older child participants had recalled more details for the traumatic memory, possibly a result from their increased cognitive ability to reflect on the experience due to maturation.

DRM Task

A frequent procedure used for testing the occurrence of false memory is the Deese-Roediger-McDermott (DRM) procedure, (Brainerd, Reyna & Forrest, 2002; Brainerd, Forrest, Karibian & Reyna, 2006; Miller, Guerin & Wolford, 2011). In this task, participants are presented with a list of words that have high association, such as bed, snooze, and rest. Despite the fact that the central word is not presented, both adults and children may incorrectly recall the central word and thus, show evidence of having formed a false memory. The Fuzzy-trace theory has been used to explain the formation of memories in the DRM paradigm. Fuzzy-trace theory suggests that episodic memory could fall into two categories: gist memory (general memory of an experience) and verbatim memory (precise memory of details). Gist memory leads to the false recall of critical lures (Brainerd, Reyna & Forrest, 2002, Holliday, Brainerd & Reyna, 2010) because when people are not relying on verbatim memories, they may recall information that simply seems plausible, but is not necessarily accurate.
Traditionally this procedure has been used for adults, but more recently it has also been used for children (Anastasi & Rhodes, 2008; Bouwmeester & Verkoeijen, 2010; Howe, 2007; Metzer et al, 2008; Howe, Wimmer, & Blease, 2009; Otgaar, Peters & Howe, 2011). Findings within this paradigm indicate that the formation of false memories increase with age due to an increased understanding of word associations (Anastasi & Rhodes, 2008; Holliday, Brainerd & Reyna, 2010). Several studies have manipulated word lists in order to analyze the impact of gist memory for child false memory in the DRM paradigm.

In a study conducted by Sugrue, Strange and Hayne (2009), the length of the DRM lists was manipulated in an effort to whether shortening the list length would reduce false memory of unrepresented critical lures. This was done because, while most DRM studies have used long word lists consisting of fifteen items, short lists should make it easier to remember which specific items were presented and which were not (i.e., people may be able to rely on verbatim memory). The study utilized both long lists (15 words) and short lists (7 words) for their adult and child participants. It was found that short lists led to fewer false recalls than the long lists. For the short lists, verbatim memory must have been responsible for allowing participants to have greater precision in recalling and recognizing represented words. That is, short lists did not allow for the theme, or gist, to take spotlight over the specific listed items. In addition, the small difference between the age groups may have been due to ten year old children having enough semantic understanding of word associations.

Two other studies considered that differences between age groups may be due to DRM lists utilizing words that are geared towards adult semantic understandings. In other words, children and adults probably have differing levels of familiarity with the traditional DRM word lists. Carneiro et al. (2007) manipulated the content and length of the lists so that preschoolers, second-graders, and preadolescents received shorter lists consisting of age appropriate words. Age appropriate lists increased the level of false recall for preschoolers, but these results maintained lower false memory rates than that of older children and preadolescents. The increase of false recall seemed to have occurred because the short lists included words that the children were familiar with and allowed for development of word association.

Anastasi and Rhodes (2008) compared false memories between adult-normed lists and child-normed lists. Both the adult and child participants had received the two types of lists and each list was the traditional length (15 words). Overall, children had fewer false recalls than the adults and children had fewer false recalls for child- than adult-normed lists. They also found a difference between the younger children and the older children. Although both age groups had similar proportional performance in recognizing list items, the 5- to 6- year old children were less likely to falsely recognize an item than the 7- to 8- year old children. Although the older children may not have seemingly had that much more experience with words than the younger children, they demonstrated greater understandings and associations for the listed words and therefore had poorer performance in remembering which words were not presented.

The studies discussed thus far have shown that younger children consistently have lesser false recall than adults and older children. Despite using varying list lengths and age appropriateness, results indicate that these factors did not have enough impact to change the process that younger children use for recall. Child-normed lists were used in an attempt to address any lack of familiarity and semantic understanding of the word associations present in the DRM paradigm. This modification did increase association and activate a theme weakly enough to increase false recall, but not strongly enough to make their performance poorer than older participants. It may be that older participants are just at a developmental disadvantage due to their greater experience with words and language.

The findings indicate the important role of gist memory on accounts of conceptual categorization of words and formation of false memory. Besides shortening the lists, researchers may need to develop more innovative methods to decrease participants’ activation of gist memory. One study (Holliday, Brainerd & Reyna, 2007) altered the content of the words so that surface cues were
more salient than content, and therefore switching older participants from gist to verbatim memory. When words were presented as fragments with the last letter missing, (e.g. cok), the older children’s false recall had greatly decreased and the younger children’s false recall had only slightly decreased. The ability to use gist memory was blocked by presenting the words without the semantic associations that DRM lists typically have.

DRM and Emotional State

Some research has shown that emotion may influence memory during the DRM procedure. In many studies, emotion during a memory task is elicited by having the word lists consist of negative emotional words such as thief and anger. Negative emotion may increase word association in a list due to the emotional weight of the words and increase likelihood of falsely recognizing or recalling a word. In a study by Wright, Startup and Matthews (2005), adult participants experienced an emotion inducer before the DRM memory task. After listening to negative affect music, adults remembered more false critical lure items from the DRM lists. The opposite was found for those who had listened to positive affect music. Adults have also been shown to falsely recognize negative emotional words more than positive words (El Sharkawy et al., 2008; Howe et al., 2010). In regards to eyewitness testimony, witnesses in a negative emotional state may feel the need to give quantity over quality and therefore increasing the likelihood of giving false information. They may also confuse accurate details with plausible but false details. For example, an eye witness could remember the fear experienced during a robbery but incorrectly remember the type of weapon present at the scene (e.g. a knife or gun). Children may also be vulnerable to holding the emotional charge in greater detail than the specific pieces that occurred during an event.

Recent research has shown that negative emotional words have a damaging effect to accuracy in children’s memory. Howe (2007) utilized neutral and negative emotional DRM lists to study false memory in children and found that negative emotional items were less falsely and less correctly recognized than the neutral items. These results indicate that children were less susceptible to false items, due to a possible narrowing of attention. Howe suggested that attention and focus may have increased due to the distinctive nature of the negative emotion words. However, this study used adult-normed lists and therefore may not have truly found results based on emotional state, but possibly due to level of arousal. Both positive (excitement) and negative (fear) emotions have similar physical signs, such as: sweaty hands and a faster paced heartbeat. Howe et al. (2010) found that neutral list items were better recalled than negative emotional items and that younger children had lower rates of false recalls than the eleven year old children. This study supported the idea that negatively charged words are harder to correctly recall due to their high association to each other, resulting in higher rates of false recognition.

The influence of emotion on recall of an event appears crucial for consideration of accuracy. This factor serves useful to keep in regard when involving testimony to highly negative, emotional experiences such as sexual abuse. Previous research indicates that younger children, such as those involved in sexual abuse cases, have less occurrences of false memory in recall and recognition for the DRM paradigm than older children and adults (Anastasi & Rhodes, 2008; Carneiro et al., 2007; Sugrue, Strange, & Hayne 2009). However, previous research has shown that children are less accurate when negative emotional word lists are used and negative emotions are induced, (Howe, 2007; Kulkofsky & Klemfuss, 2008). Separately, emotion and content of word lists have had progress in analyzing their influence in child memory. Much less research has focused on their interaction within the DRM paradigm.

Further investigation into the interaction of emotion and false memory is required to gain insight into the impact of negative emotional state during child testimony. In the current study, children in two age groups (4-5 years old and 7-8 years old) had their memory for critical lures tested. Importantly, the children were assigned to a condition that induced either a positive or negative emotion. Based on findings from Anastasi and Rhodes (2008), it was predicted that there would be an effect of emotion that children in negative emotional states will have greater incidences of false recognition than children in positive emotional states. Second, a main effect of age will show that younger children will have fewer false
memories than older children. Finally there should be an interaction where older children in a negative emotional state will have greater rates of false recognition and recall than older children in a positive emotional state or younger children in either emotional state.

**METHODOLOGY**

**Participants**
Forty 4-5 year old children will be recruited from Las Vegas preschools, and forty 7-8 year old children will be recruited from Las Vegas elementary schools. The preschool and elementary school children will be recruited by contacting teachers and providing informed consent forms for parents to sign. Efforts will be made to contact preschools and elementary schools from similar neighborhoods so that socio-economic status is not a factor across age groups. In exchange for participation, children will receive small toys.

The selected ages have been previously used in false memory research and are within the norm age range of child testimony in sexual abuse cases, (Anastasi & Rhodes, 2008; Melnyk & Bruck, 2004).

**Materials and Procedure**
All children will participate individually and experience an emotion inducer, word lists, recall tests, and recognition tests with a distraction task.

To evoke an emotion, the experimenter will tell the child that s/he lost her/his favorite toy and needs the child’s help to find it. The child will be instructed to look for it in a toy bin that contains various toys, such as a ball, doll, train, bubbles, teddy bear, and a car toy. If the “lost” toy is found, then the child will receive a prize. If the toy is not found, then the child will not receive a prize until after completion of the study. Half of the children in each age group will find the specified toy because it is present in the bin, and the other half will not find it because, in this condition, the toy will not be inside the toy bin. It is expected that prize winners will be in a positive emotional state and those who did not receive a prize will be in a negative emotional state.

During the emotion inducing task, a video camera will record participants’ behaviors and facial expressions to see if the task induced the desired emotions. Research assistants, unaware of the study hypothesis, will code the video for signs of positive (open or closed mouth smiles) or negative (furrowing of brows, pursed lips, tense hands) emotion.

Following the emotion inducing task, the word lists will be presented. Word lists will be created by the same procedure mentioned in Anastasi and Rhodes (2008), by asking a separate group of twenty, 4- to 8-year old, children (i.e. this group will not participate in the main experiment) to name the first three words that they thought of after hearing the critical lures (sleep, fruit, rough, music, smell, and window). The top fifteen generated words for each critical lure will become the list.

Participants will receive instruction to listen very carefully to the words that the experimenter will present orally at approximately a 2-sec per word rate. After listening to each list, children will be asked to recall as many words as possible.

Experimenters will use a checklist to note correctly recalled list words and falsely recalled non-list words. After each recall task, children will participate in a short distraction task (shape and color identification) to decrease any possibility of recalling words from previous lists. Once all of the recall tasks are completed, the recognition test follows. During the recognition phase, participants will be instructed to use a checklist to indicate which words came from the previously heard lists. They will receive a 32 item, yes/no checklist comprising of 18 list items, 7 critical lures and 7 non-list items.

In summary, half of the participants within each age group will experience a positive emotion inducer and the other half a negative emotion inducer. Assignment of emotion condition and the order of the lists will be counterbalanced between participants to control for any possible influence of order effects.

**RESULTS**
For both the recall and recognition data, the design will be a 2 (Age: five year olds, eight year olds) x 2 (Emotion: sad, happy) x 2 (Item: (list, critical lure)) between subjects design. The dependent variable is the likelihood that the critical lures were recalled or recognized, respectively. As described earlier, similar patterns are expected for both the recall and recognition measures. First, there should be a main
effect of age; older children will have greater rates of false memory than the younger children. Second, there should be a main effect of emotion; children in negative emotional states will have higher rates of false memory than children in positive emotional states. Finally there should be an interaction where older children in a negative emotional state will have greater rates of false recognition and recall than older children in a positive emotional state or younger children in either emotional state.

DISCUSSION
Court cases will most likely continue to require children to provide their testimony in highly sensitive and emotional experiences. It seems important to keep in mind that emotions could play a part in the accuracy of their memory. The nature of arousal during an experience can evoke discrete emotions such as sadness and happiness, and both of these emotions have associations to self-perceived confidence and competency (Levine, Burgess & Laney, 2008). The proposed study expects to find that children in a sad emotional state will be more likely to include words not mentioned in the word lists than children in a positive emotional state. Older children have shown to have higher rates of false memory within the DRM paradigm so it is expected that the current study will support these results.

It seems counterintuitive that older participants would be more vulnerable to false recall and recognition when considering that during court processes, adults are considered as more reliable and accurate than children. Older children should have stronger developed skills in emotional regulation, confidence and autobiographical narrative and therefore have less false recall and recognition than the younger children (Kulofsky & Klemfuss, 2008). However, older children, who have higher language skills, can use language as a means for elaboration in episodic memory. The tendency to elaborate could be highlighted in older children when negative emotion activates low confidence.

Considering that children in a negative emotional state have been shown to over incorporate information (Levine, Burgess & Laney, 2008), then the National Institute of Child Health and Human Development (NICHD) protocol may be useful to reduce the likelihood of misleading witnesses. The NICHD protocol for interviewing includes utilizing as many open ended and cued recall questions as possible while minimizing yes-no questions. Doing so should lessen the possibility of incorporating misinformation (Odegard et al., 2009) and pressuring the child to overproduce details of an experience. The results of the current study may suggest that emotional states need to be accounted for as well.

LIMITATIONS AND FUTURE RESEARCH
Additional research is needed to replicate the expected results and further elaborate on the impact of negative emotional states on false memory. Further investigation is also required to investigate differences in rates of false memory for emotional impact. Positively or negatively associated memories may have differences in later testing for recognition of word lists. Along this line, future studies should also more closely examine whether there are differences as to whether the emotional state occurs during the experience, while remembering the information, or both. Another possible limitation in the current study was that emotions were induced by asking participants to assist the experimenter in finding an object and those that successfully completed the task received a reward. The results of the participants’ efforts (receiving or not receiving a toy), may not be sufficient enough to elicit the desired positive or negative emotions or effectively replicate the natural experience of emotions outside of the laboratory. If possible, other measures could be used to ensure that the desired emotion was actually induced.

Finally, although the DRM procedure is widely used by researchers to investigate false memories, the task is not exactly the same as a traumatic experience that may occur. At this stage of researching this topic, the DRM is a good first step to establish emotional effects on false memories. However, future research should move toward using more ecologically valid experiences, as long as it can be done in an ethical manner.

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THE EFFECT OF SPIRITUALISM ON THE NEURO-Psychological Function of Memory

BY CARLA FARCELLO

ABSTRACT
The amount of physiological-neurological research performed over the past few years has dramatically increased due to our ability to view the structure and function of the brain in living human beings. The use of imaging tools has resulted in huge strides forward in unlocking some of the mysteries of the 3 pound universe—the human brain. One of the more unique neural processes being recently addressed is the affect of belief and spiritualism—the sense of being connected to something larger than oneself—on the human brain. Substantiation of the influence of the mind on the body is plentiful. Biofeedback, visualization, meditation, and practices such as prayer and control of behavior are used in medical and psychological treatments associated with mind-

The materials used for this study included 3 scales (the Emotional Verbal Leaning Test, Underwood’s Daily Spiritual Experience Scale, and the Beck Depression Inventory–II) and 1 demographic questionnaire. At this time, the study is still ongoing.

INTRODUCTION
The amount of physiological-neurological research performed over the past few years has dramatically increased due to our ability to view the structure and function of the brain in living human beings. The use of imaging tools has resulted in huge strides forward in unlocking some of the mysteries of the 3 pound universe—the human brain. Some of the areas in which we have made remarkable progress include neural issues associated with personality, memory, criminal behavior, impulsiveness, and moral behavior.

One of the more unique neural processes being recently addressed is the affect of belief and spiritualism—the sense of being connected to something larger than oneself—on the human brain. Substantiation of the influence of the mind on the body is plentiful. Biofeedback, visualization, meditation, and practices such as prayer and control of behavior are used in medical and psychological treatments associated with mind-

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body healing. A body of studies has identified prayer, specifically, as having a significantly positive influence on many brain processes and functions. Bingaman (2011) reports that “Christian practices rather than beliefs” per se, result in less fearfulness and lowered anxiety during one’s everyday life (p. 1). Lower levels of anxiety reduce harmful cortisol concentration in the nervous system thereby leading to longer life and better overall health. Epilepsy, an invasive type of electrochemical brain disorder, has been shown to be mediated by prayer-type yoga exercise because prayer “reduces seizure frequency, relieves depression, decreases social segregation, and promotes cardiac and general health” (Khan, Ahmad, Beg, Ismail, Abd Alla, & Nubli, 2010, p. 391). While studying the affect of prayer on outcome in patients with traumatic brain injury, Vannemreddy, Bryan, and Nanda (2009) found that patients who practiced prayer demonstrated better recovery following surgery. A project assessing functional magnetic resonance imaging results of a group of Danish Christians found that brain areas associated with social cognition were highly activated during prayer (Schjøedt, Stødkilde-Jørgensen, Geertz, & Roepstorff, 2009).

The essential cognitive function of memory has also been shown to be influenced by prayer. Fabbro, Muzur, Bellen, Calacione, and Bava (1999) report that working memory tasks administered while participants prayed resulted in significant reduction of spontaneous, intruding thoughts thereby facilitating memory. Based on evidence from brain scan studies performed during the administration of memory tasks on individuals who practiced prayer and meditation, Newberg and Waldman (2009) found positive and permanent changes in the brain. Another study demonstrated a transformation of personality and increased productivity resultant from the affect of prayer on participants’ memory, imagination, and emotions (Simon, 1989).

Not only have various studies shown improvement of neurological capabilities, but the activities performed by the participants can be administered at any stage of a neurological disorder. Procedural and Emotional Religious Activity Therapy (PERAT; Vance, 2005) incorporates religious activities that are both emotionally-salient and also have a procedural memory component effective in improving memory. Compared to more common therapies like pet, art, or music therapy, the PERAT protocol requires that participants engage in religious activities which have long governed a majority of their lives. This includes, but is not limited to, reading the Bible, lighting the Menorah during Hannukah, or facing in the direction of Mecca during prayer. PERAT has been shown to lessen behavioral problems as well as improve quality of life. Given its neurocognitive influence on memory, the role of prayer warrants further study.

LITERATURE REVIEW

“Our minds are like Pentium chips; they remember everything” (Foer, 2011, p. 14). However, only a minute fraction of the world’s population has ever been able to categorize information in such a way that retrieval is much like picking through a well-organized filing cabinet. I suppose one must be gifted with such a mind and many would agree. However, science-journalist and winner of the 2006 U.S.A Memory Championship, Joshua Foer, corrects this statement and declares that our minds, as it is hard to believe, really are capable of remembering everything. According to Foer, we just need to learn how to think in memorable ways (Foer, 2011). There is an art to memorization. Originally invented in Greece by the poet Simonides, the Method of Loci has been used successfully ever since Italian Orator Cicero memorized his speeches (Foer, 2011). This technique was also used by Christian monks who memorized every verse in the Bible and recited them via word and paper.

People used to spend hours perfecting memorization techniques, which is unheard of today (Foer, 2011). We do not have a need to perfect our minds in such a way because we have technology to supplement our long-term memory. When you telephone a friend, do you have their number memorized by heart or is the phone number stored in your phone? It seems as though we no longer completely trust our minds with all important information.

In 2008, brain gyms and memory boot camps were a growing fad and brain training software was a 265 million dollar industry (Foer, 2011). This appears to be contradictory. We do not trust our minds with all valuable information yet we spend
millions of dollars training our brains to perform
tasks that we relegate to technology. Part of the 265
million dollar gross expenditure was allocated to
recent research demonstrating that exercising
one’s brain may ward off both Alzheimer’s disease
and progressive dementia (Foer, 2011). Could
spirituality cause the same effect regarding
memory? Can it be that our “thinking in a
memorable way” will organize our own personal
filing cabinet in our minds? Could spirituality help
patients with Alzheimer’s disease and types of
dementia?

While extensive information exists in regard to
memory, spirituality has only been recently gaining
attention in academia. Spirituality has long been an
integral part of human culture yet science has
rarely tried to unlock an understanding of the
effects resulting from such practices nor has
science acknowledged spirituality as a variable to
be considered in empirical health research.

Spirituality is something which can have various
meanings and be experienced in different ways
according to each person. There are many forms of
yoga, meditation, and prayer all designed with a
goal of getting closer to God or experiencing
enlightenment and oneness with the world around
oneself. Prayer is just one aspect of spirituality that
is widely practiced and yet treated mostly without
regard to its cognitive content or cultural framing
(Wuthnow, 2008). For the purposes of this study,
spirituality is defined as a belief in something
higher than oneself.

The words “God” and “Science” are almost never
uttered in the same sentence without hostile
connotations behind them. Newburg & Waldman
(2009) state that “no matter how hard we try, the
ultimate nature of the universe continues to elude
our brain” (p. 4). Neuroscience may not be able to
answer questions about where humans originate
from, but it can record the effect that religious
beliefs and experiences have upon human brain
processes such as cognition (Newburg & Waldman,
2009). “Furthermore, it can tell us how God-as an
image, feeling, thought, or fact-is interpreted,
reacted to, and turned into a perception that feels
meaningful and real” (Newburg & Waldman, 2009,
p. 4). With approximately 95% of all Americans
claiming to have a religious or spiritual affiliation
(Bonner, 2002), conducting scientific research
related to spirituality would not only help

Vannemreddy, Bryan, and Nanda suggest that
“What quality of life is a multidimensional construct
composed of functional, physical, emotional,
social, and spiritual well-being” (2009, p. 264). There
have been many past studies which suggest better
emotional states, such as anxiety and depression,
and a better health-related quality of life including
greater longevity, coping skills, and quicker recovery
from illness experienced by individuals who
practice a form of religious involvement and
spirituality (Vannemreddy, Bryan, & Nanda, 2009).

Bingaman claims that something transcendental is
involved with the mind, consciousness, and the
path of awakening—call it God, Spirit, Buddha-
nature, the Ground, or something else. Whatever
name it goes by the transcendental dimension is
ultimately beyond the physical universe (2011).
Bingaman further claims that recent neuroscientific
research has revealed that the human brain, far
from being fixed and unalterable as it was once
thought to be, has an astonishing capacity for
change, continued growth, and for transforming its
very own structure (2011). This revelation in neural
research is referred to as the neuroplasticity
revolution.

This unique transformation of the brain does not
happen over night or during a short span; the
changes, according to Bingaman, are tiny,
incremental alterations in neural structure that add
up as the years go by (2011). Our brain does not
stop learning at a certain age; it just takes longer to
produce any detectible changes. Learning a new
language at a more matured age has long been
thought of as an impossible task. With new
neuroimaging brain scans of Buddhists in
mindfulness meditation documenting “tangible
changes in a client’s neural circuitry and brain
structure” (Bingaman, 2011, p. 479), we should
reconsider what our minds are capable of.

With the anticipated quadrupling of Alzheimer’s
disease cases to 20 million in the next two
decades, a new approach called Procedural and
Emotional Religious Activity Therapy (PERAT) has
been helping improve the minds of individuals with Alzheimer’s disease and related dementias using spiritually-laden activities (Vance, 2005). Compared to the popular pet, art, and music therapies typically administered, PERAT better holds the attention of the patient and shows cognitive gains (Vance, 2005). Montessori activities are the only other therapies which exhibit the same subtle cognitive gains (Vance, 2005). PERAT focuses on finding activities that are meaningful and within the adult’s cognitive range (Vance, 2005). The activities focus on procedural memory skills and emotional attachment, automatic or unconscious memory and mental feelings which remain intact during most of dementia stages as opposed to executive, and explicit memory skills which include the abilities to reason and to consciously recall information (Vance, 2005). These are the first of the cognitive systems to deteriorate in patients with dementia (Vance, 2005). The therapy can be used with various religious and spiritual paradigms. Patients of the catholic faith, for example, would recite the Rosary, recite popular scripture, or hold religious symbols. Patients of the Islamic faith would face towards Mecca to pray and patients of the Jewish faith would light a menorah (Vance, 2005). With continued studies of PERAT involving other forms of dementia such as Parkinson’s disease and Huntington’s disease, this therapy shows great potential in providing motivating and meaningful activities for patients.

“Various rituals of faith can be effectively used with the Christian older adult as spiritual care interventions and memory joggers of both who they are and where they are and whose they are” (Mooney, 2004, p. 187). According to Mooney, for individuals with Alzheimer’s dementia, the sense of personal identity and the memories that shaped it have gradually become swallowed up in a sea of forgetfulness that results in what has been described as the very “loss of self” (2004, p. 184). Spirituality may help regain that “lost self” for patients.

Another study used spiritualism as a positive life theme to determine cognitive bias in individuals. Verno, Cohen, & Patrick (2007) studied community-dwelling adults’ cognitive processing using a positive life theme of spirituality as a schema. Their hypothesis contended that “spirituality may result in cognitive bias in which highly spiritual adults focus on positive rather than negative elements in their environment” (Verno, Cohen, & Patrick, 2007, p. 1).

Several hypotheses were tested with an expected interaction between age, spirituality, and type of word recalled. Previous studies have shown that the most spiritual age range is of the older adults. Due to these results, older adults were hypothesized to display a cognitive bias toward positive words on the memory tasks. The study showed, in contrast, that spirituality did not appear to be related to a positive bias and did not indicate spirituality to be linked to different styles of cognitive processing (Verno, Cohen, & Patrick, 2007).

In contrast to studies which support evidence with a connection between neuropsychology, neuroscience, and spirituality, Teske claims, “If we are to arrive at a theological system that is coherent with science, we need to see how our neuropsychology is necessary for our spirituality” (Teske, 1996, p. 209). Human spirituality requires capacities for reflection, for self-knowledge, and for self-transcendence. These capacities are, however, limited in humans. “These capacities require a neuropsychological endowment sufficient for mapping, modeling, or symbolically representing a world and a self within it” (Teske, 1996, p. 210). Such capacities entail limits that, as spiritual beings, we need to acknowledge. These include four different types of limits (Teske, 1996). The first limit is that selection entails limitation. Knowing about the world and being able to represent the world in useful ways will always involve a process of selection; perceiving the world to the individual’s advantage. The result of this perception is that our representation of the world will be incomplete, limited, or even distorted in the direction of the individual’s values. The second limit is that abstraction entails separation. Knowing about the world involves a process of abstraction across objects or events. This abstraction enables us to escape from the particulars of our immediate circumstances, generalize, and respond to new situations. “The result is that our relationship to the world is always mediated through abstractions and will be separated from it, losing the uniqueness of concrete relationship” (Teske, 1996, p. 210). The
third limitation is that construction entails fabrication. Knowing about the world involves building representations which can happen in multiple ways. “The result is that our knowledge of the world is always perspectival and is likely to be egocentric, fabricated, and self-deceptive” (Teske, 1996, p. 210). The final limitation is that specialization entails partition. “Knowing about and functioning within a complex world requires specialized parts and specialized representations” (Teske, 1996, p. 210). In a limited-capacity system, this results in some degree of partition of modularization. This always runs the risk of fragmentation as the system differentiates and communication between elements decay. “Like knowledge of the world in general, knowledge of oneself is selective, abstract, constructed, and specialized” (Teske, 1996, p. 210). Even fragile self-knowledge can point to the limitations and finitude we hope to transcend. “Our spiritual life is made possible, and given its challenges, by the appropriation of symbolic meanings that constitute conscious mental life” (Teske, 1996, p. 210). The central challenge is to construct, to represent, and to symbolize the self which is our only support of personal wholeness. This pursuit of integrity, as much a spiritual as a psychological pursuit, is dependent upon our neuropsychology but not required by it (Teske, 1996).

The purpose of the current study is to analytically research our hypothesis that better memory will be documented among the experimental group who report being spiritual and engage in prayer. These findings have very important implications regarding the potential of prayer to improve memory function in individuals of different ages and perhaps with differing brain function. Although beyond the scope of this project, we hope to follow up on this study by broadening the definition of our participants to include a wider age range, more diverse ethnicities, and individuals with cognitive injuries or disorders.

Summary of Literature Review
While extensive information exists in regard to memory, spirituality has only been recently gaining attention in academia. Spirituality has long been an integral part of human culture yet science has rarely tried to unlock an understanding of the effects resultant from such practices nor has science acknowledged spirituality as a variable to be considered in empirical health research. Therapies like Procedural and Emotional Religious Activity Therapy (PERAT; Vance, 2005) and new research provides evidence that spirituality has the potential of being “memory reminders” for Alzheimer’s disease and dementia patients and improve quality of life for the patients (Mooney, 2004). Given its neurocognitive influence on memory, the role of prayer warrants further study.

**METHOD**

**Participants**
Study participants from the University of Nevada, Las Vegas will include 40 individuals; an experimental group of 20 healthy adults aged 18-30 years who consider themselves to be spiritual (the sense of being connected to something larger than oneself) and a control group of 20 healthy adults aged 18-30 years who consider themselves to be atheists. The participants are recruited through flyers which are posted throughout the University of Nevada, Las Vegas campus.

**Materials**
Our materials include 3 scales and 1 demographic questionnaire. The first scale is the Emotional Verbal Learning Test (EVLT) which was created by Gregory P. Strauss, Ph.D and Daniel N. Allen, Ph.D (2003). The EVLT is designed to measure recall and recognition of emotional learning and memory. Resembling the CVLT-II in structure, the EVLT word lists represent emotional categories allowing evaluation of emotional specific processing (Strauss & Allen, 2003). Scoring involves labeling each word recalled by the participant as correct, intrusion, or repeat. The measure first has the experimenter orally present 16 words (List A) over five immediate-recall trials with the list consisting of 4 words from each of the four emotion categories (Happiness, Sadness, Anger, Anxiety) (Strauss & Allen, 2003). Following the five trials for List A, a second “interference” list (List B) is orally presented for a single trial. These words consist of 8 disgust words and 2 words from each of the 4 List A categories. After list B is completed, a 20 minute delay occurs. After the 20 minute delay, a long delay free and cued recall of List A and a yes-no recognition format is orally presented (Strauss & Allen, 2003).

The second scale is called the the Underwood’s Daily Spiritual Experience Scale* (DSES).
Underwood of Hiram College designed this 16-item Likert-type self-report measure to assess ordinary experiences of connection with the transcendent in daily life (Underwood & Teresi, 2002). This Likert-type scale had all items formatted with never, almost never, once in a while, some days, most days, every day, and many times per day (Loustalot, Wyatt, Boss, May, & McDyess, 2006). Many times per day represented the lowest numerical category (1), and never or almost always, the highest (6). Question 16 (In general, how close do you feel to God?) was scored differently. Responses to this item include not close at all, somewhat close, very close, and as close as possible. These responses were scored from 1 to 4 with 1 being as close as possible and 4 being not close at all (Loustalot, Wyatt, Boss, May, & McDyess, 2006).

Loustalot, Wyatt, Boss, May, & McDyess (2006) examined the test-retest reliability of the daily spiritual experiences scale. The data for the study was gathered on two occasions, two weeks apart, from a convenience sample of 40 African American adults (Loustalot, Wyatt, *Permission to use this scale was granted by © Lynn G. Underwood (2006). Boss, May, & McDyess, 2006). “Criterion validity, represented by concurrent validity, was assessed in this study with ANOVA methods” (Loustalot, Wyatt, Boss, May, & McDyess, 2006, p. 165). The findings provide evidence that the 16-item DSES are stable over time and internally consistent.

The third scale is the Beck Depression Inventory–II (BDI-II), created by Beck (2006). It is a 21 item measure which assesses the intensity of depression in clinical and normal patients. Osman, Kopper, Barrios, Gutierrez, & Bagge (2004) studied the validity of the BDI-II by having doctoral level clinical psychologists and adolescent psychiatric inpatients evaluate the scale. The doctoral level clinical psychologist participants were mailed a questionnaire packet that included the BDI-II, a brief demographic information questionnaire, a list of the Diagnostic and Statistical Manual of Mental Disorders, a 5-point rating scale (1 = not at all relevant to 5 = extremely relevant) for rating the relevency of each BDI-II item as a major depressive disorder, and an overall BDI-II rating scale was also included for the participants to provide additional comments and other relevant ratings (Osman, Kopper, Barrios, Gutierrez, & Bagge, 2004).

The second group of participants, adolescent psychiatric inpatients, were recruited to rate on a 5-point rating scale (1 = very hard to read and understand to 5 = extremely easy to read and understand) the BDI-II scale according to clarity. The studied concluded that the BDI-II scale is highly useful in screening for depression severity with adolescents. However, the results do suggest the need to revise or drop items that do not correspond directly to any of the DSM-IV symptoms of major depressive disorder (Osman, Kopper, Barrios, Gutierrez, & Bagge, 2004).

**PROCEDURE**

Qualified participants are scheduled for testing sessions Monday – Saturday from 9am-6pm. Upon arrival at the testing room, each participant is greeted and taken to a private, sound proof study room. The EVLT is administered first. The participant is to complete the first 20 minutes of the test and then will be given 20 minutes of additional tasks that will be used as a working memory distracter. These tasks include the informed consent form, demographic form, BDI-II measure, and DSES measure. After the 20 minute delay, the second part of the EVLT will be administered. After the EVLT is completed, the participant will be compensated $10.

The data will be analyzed by comparing the score from the EVLT to the DSES. The BDI-II is used as a variable in this study.

**FURTHER STUDY**

Once finished with the current study, we hope to follow up by broadening the definition of our participants to include a wider age range, more diverse ethnicities, and individuals with cognitive injuries or disorders. One limitation to our current study is that we do not include participants who claim to be agnostic. Including agnosticism may give us a better understanding of the relationship between spirituality and memory.
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ABSTRACT
Alcohol and drug consumption are a public health concern among young athletes throughout the entire nation. Therefore, the purpose of this paper is to review substance abuse prevention and intervention outcome studies specific to athletes. A list of common keywords associated with outcome studies targeting substance abuse prevention and intervention among student athletes was generated. Interventions were derived from peer-reviewed journals, government websites and newspaper articles. Two interventions were found to successfully decrease excessive drinking and drug use among student athletes. While some researchers may argue that involvement in athletics may serve as a “protective factor” for alcohol or substance abuse, the current information shows otherwise (Labrie, 2009). Controlled research experiments targeting substance use frequency are needed for use in athletes.

INTRODUCTION
Alcohol and drug use among collegiate students, particularly student athletes, is a growing problem. In a study of women who had been victims of some type of sexual aggression while in college, 68% reported that their male assailants had been drinking at the time of the attack (Wechsler, H., Lee, J., Kuo, M., Seibring, M., Nelson, T., & Lee, H, 2002). While some researchers speculate that involvement in sports, mostly for women, serves as a protective factor for substance use among college students (Thiblin, 1999). The research found in recent studies depicts a different outlook. Indeed, athletes appear to engage in abusive alcohol use just as much as non-athletes do if not more (Ford, 2008).

The purpose of this paper is to assess available interventions targeting substance use in athletes. It is hoped that this paper will serve as a cornerstone to inspire other researchers to conduct more efficient research studies in this area. Along a slightly different vein, testing ethnicity differences in alcohol and drug use among Caucasians, African-Americans and Latinos athletes is particularly warranted.

The proposed review will be based on data compiled through peer-reviewed journals and contemporary newspaper articles. Reviewed articles include studies that were conducted in a wide array of locations and
samples. The importance of this research is underscored by the lack of effective interventions found among troubled student athletes.

Prevalence and description of drug and alcohol abuse among student athletes
Binge drinking is considered alcohol abuse when a person has four or more alcoholic beverages, one after the other (CDC, n.d.). The following information supports that alcohol and drug abuse is a prominent habit among high school and collegiate students. An article in the Las Vegas Sun Newspaper written in 2009 outlined the actual percentages of alcohol users. Over 8% of student athletes from a public high school located on the North Las Vegas, Nevada, tested positive for drugs and alcohol use (Richmond, 2009). Another study reported that in 2001, the Hunterdon Central Regional High School located in eastern New Jersey implemented an anonymous survey among its high school students. According to Dupont & Mazza, 2002, 43% of all senior high school students had used marijuana, 70% had used alcohol, over 10% of all students had used hallucinogens, and 15% had used cocaine. These results reflect the severity of drug and alcohol abuse among adolescent students. Further research from the National Youth Risk Behavior Survey in 2003 found similar results. According to results from this survey, more than 40% of high school students reported drinking alcohol. In another study underage students reportedly drank alcohol during the past 30 days. In another study underage students reportedly drank alcohol during the past 30 days and 28.8% binge drank (Miller, 2006).

While various studies imply similar time frames, in which student athletes begin the usage of alcohol and illicit drugs, the previous article agrees with the following research findings which support the idea that adolescence is the peak time of drinking and drug use among students. Psychologists outline that adolescence is the primary peak period for alcohol use among athletes (D’Amico & McCarthy, 2006). Thus, from the researched information acquired, adolescence seems to be the crucial stage where drug and alcohol abuse is spawned, particularly between ages 18 and 25 years (Ford, 2007).

Strong relationship between alcohol/drug abuse among athletes and social environment/norms
While the previous findings support the idea that drug and alcohol abuse begins at an early age, the following suggests adolescents abuse drugs in educational institutions, as youth may network with one another and establish social bonds with various social groups. Such environments serve as a place where social norms can be taught and mimicked for social acceptance. Norms draw boundaries for people to follow and provides a sense of “belonging” among peers. According to the social identification theory, “Not all groups are equal and the behavior of individuals is influenced by the groups with which they perceive a sense of belonging” (Cho, 2006, p.419).

Similarly, another article expressed the importance of social norms by expressing the notion that norms help establish rapport and preserve cohesiveness among group members (Perkins, 2002). Binge drinking is another way student athletes socialize. Even though negative consequences stem from binge drinking, the action is consistently reported as being higher in student athletes versus their non-athletic peers (Yusko, 2008). Noting that student athletes are at higher risk for drinking than non-athletes, leads researchers to believe that college students, too, abuse drinking more than people who do not attend educational institutions. Some data support college students hold an adherence to social bonding, through binge drinking. For instance, college students are more likely to become alcohol dependent than their peers who do not attend college (Martens, M. P., Dams-O'Connor, K., & Duffy-Paient, C., 2006). Researchers can speculate that college norms among peers strongly support alcohol abuse.

Characteristics and consequences of drug and alcohol abuse among athletes
It is important to highlight characteristics of drug and alcohol abuse among adolescents and the negative effects of drug and alcohol abuse. According to a recently published article, student athletes are at greater risk for recreational drugs and detrimental factors the lead to use of anabolic drugs (Ford, 2008). This may signify that the athletes who use steroids might start drug abuse with cannabis. Furthermore, another article reported that adolescents who used anabolic drugs not only shared needles but were more likely to use other drugs (DuRant R, Rickert V & Ashworth C., 1993). This finding suggests that anabolic drugs are not the first class of illicit drugs abused by many student athletes; rather drug use transgresses from petty drinking, to cannabis, to more serious drugs such as cocaine and methamphetamine, and so on.

After noting the transgression among athletes and their amount of consumption, ranging from petty
drugs to more serious drugs, some of the negative consequences of the use of drug and alcohol among adolescent athletes may be discussed. The negative consequences that directly affect the abuser include: passing out, regurgitating, aggressiveness, poor lack of judgment and slow reflexes. The most serious consequence that requires the immediate attention of adults is suicide. All of these symptoms are examples that affect student athletes. The consequences that are viewed as less problematic are those in which the side effects are prolonged. Such consequences may involve physical deficiencies. These deficiencies include poor muscle development and lowered physical endurance (El-Sayed, M., Ali, N., & El-Sayed Ali, Z, 2005).

On the professional level of sports, athletes have been stripped of medals and baseball players have died or been suspended for using performance enhancing drugs. These outcomes are inevitable when alcohol and performance enhancers are used. The following athletes are public examples of these negative consequences. In football, Shawine Merriman of San Diego Chargers, who was one of the best athletes of his time tested positive for steroid use and received a 4-game suspension. Similarly, Olympic Sprinter Ben Johnson lost his gold medal one week after winning it. He tested positive for steroid us and lost his title as a champion, “September 27 three days after winning the 1988 Olympic Gold he tested positive for the anabolic steroid stanozolol and had to give up his gold medal and 1987 World Championship title” (Johnson, 2009, p. 1). Thus, due to the negative consequences that stem from the usage of performance enhancers, the United States government has precluded athletes from using such drugs.

Now that we established the consequences that affect the abuser directly, we can explore the consequences that pertain to those innocent people who are often affected by the student athletes’ behavior following the drug and or alcohol abuse. For example, drug and alcohol affects the abuser, and the people who socialize with the abuser. Other consequences commonly associated with such abuse include vandalism, poor academic performance and sexual misconduct (Consequences of High-Risk Drinking, 2009).

A Behavioral Model
Binge drinking is a cornerstone for drug experimentation. The following article maintains that initiation of alcohol use at a young age influences the risk of using cannabis and that early use of cannabis increases the risk of involvement with other illicit drugs (Donovan, 2004). As previously noted, smoking cannabis is one of the first stepping-stones for performance enhancing drugs. Furthermore, performance enhancers may increase the ability in performance while alcohol abuse is used to decrease the stress and develop rapport between teammates. There is a major correlation between the usage of drugs and alcohol. Further studies suggest that the correlation between depression and alcohol is quiet substantial, “Significant correlations were found between reported alcohol abuse and self-reported symptoms of depression and general psychiatric symptoms. Subjects with positive depression and psychiatric symptom ratings in the ‘severe’ range had a significantly higher rate of alcohol abuse than subjects who had low depression” (Miller, B., Miller, M., Verhegge, R., Linville, H., & Pumariega, A., 2002, p.2). As one can see, the consequences for alcohol and drug abuse do not deter the alcohol usage among student athletes.

Social conformity is a strong predictor for binge drinking and drug use leading to negative consequences making development of interventions important. Student athletes cannot avoid joining social events. However, through their participation in interventions, the chances of student athletes abusing drugs and alcohol may be minimized and in some cases, can be eliminated.

Treatment
The outcome studies in alcohol and drug abuse among athletes were reviewed. A recent study suggested that raising the awareness for negative consequences resulting from drug and alcohol abuse did not affect the amount of consumption. Indeed, such studies are educational but rarely increase any notable results in reducing adverse behaviors (Perkins, 2002). While excessive alcohol and drug abuse may pose as viable health risk to student athletes, the information conveyed has no notable effects on the choices student athletes make when drinking. It might indicate that intercollegiate athletes are prone to make poor choices when socializing. Some educational institutions seek extreme measure to regulate the use of alcohol and suppress the use of drugs.
educational institutions such as high schools was found to have an effect in reducing the drug abuse among adolescents. “Other organizations at various levels of sports have adopted programs to monitor and police drug use behaviors” (Shields, 1995, p.30). This shows that educational institutions support this intervention. While most institutions conduct drug testing, services rendered come at a high cost. Current studies suggest that random drug testing is not only costly but inefficient in dramatically eliminating the drug use among adolescents (Taylor, 1997). Other interventions may proclaim the use of religion or faith to have beneficial effects on reducing the drug and alcohol consumption. “Religiousness is extensively studied and regularly found to be a protective factor against substance use in the overall population” (Rodek, Sekulic, & Pasalic, 2009, p.446). While this theory still remains open for researchers to disseminate, no current studies suggested the efficacy or validity of this theory. Alternatively, ATLAS, an innovative intervention that involves the participation of coaches, professors and peers has been disseminated in research studies and has been found to reduce risk behaviors in youth. In addition to the participation of staff members, the sessions enhance the development of alternative exercises and contribute to sports nutrition, including role-play for real life situations. Athletes Training and Learning to Avoid Steroids (ATLAS) is a school-based drug prevention program, “The intervention included interactive classroom and exercise training sessions given by peer educators and facilitated by coaches and strength trainers. Program content included discussion of sports nutrition, exercise alternatives to AS and sport supplements, and the effects of substance abuse in sports, drug refusal role-playing, and the creation of health promotion messages” (Goldberg, 2002, p. 332). This intervention differs from other discussed interventions because it generates staff members to get involved with adolescents in a different connotation. Understanding the influencing factors that affect adolescents is a major trajectory to the development of ATLAS. The ideal intervention should include the following in the implementation process, “(1) Creating a matrix of proximal program objectives, (2) selecting theory-based intervention methods and practical strategies, (3) designing and organizing a program, (4) specifying adoption and implementation plans, and (5) generating program evaluation plans” (Bartholomew; Parcel, & Kok, 1998, p. 545). With the previous checklist, it should be easier to conduct research on an intervention that contains the key elements identified.

**SPORTS: A COMPETITION TO ACHIEVE THE STATUS QUO**

There is no doubt that football and baseball are the two major sports in the United States. Nevertheless, any sport is just as important as any other. For instance, “The sports industry today is a wide-reaching business that spans the field of play from the food to media rights and sponsorships. As much as €450 billion ($620 billion) with billions of dollars spent every year in the sports industry, which is caterers to an ever-more fervent fan base” (Kearney A.T., 2006). Unfazed by today’s economic dismays, the substantial, growing popularity of sports prominently remains cemented as the staggering numbers of fans keep steadily growing.

Now that we outlined the substantial amounts of fan base in sports, we may focus on the athletes that make up a sport because a sport is not considered a sport without its components (players). We will further explore some of the basic reasons why athletes seek and use performance enhancers while still knowing their adverse effects. Many competitive sports require strenuous physical endurance from athletes. Pressured by the social environment, many athletes resort to performance enhancers to meet such demands. Professional athletes start off as young students, “Individually motivated, professional in orientation, and driven by both financial and intrinsic reward” (Stewart, 2008, p.280). Potential professional players understand the high demand for talented athletes, which may woo aspiring athletes to maximize their performance abilities regardless of what the cost may be (Stewart, 2008). In this case, it involves jeopardizing their health for the purpose of attaining a position in a professional league or in the cases of previous famous athletes who have been caught using performance enhancers, for the purposes of maintaining their coveted position.

**METHODOLOGY**

This paper reports on data from studies of 28 recent articles from many highest-ranking academic journals in the field of psychology. Sixteen articles from the top-ranked were analyzed, along with five government websites and two newspaper articles. Although comparing the validity of various interventions was the primary motive for this paper, interventions originally chosen as the focus of prevention programs were not generalized enough. It became evident once the research paper was under way that many sport psychology related articles did not offer a prominent
intervention to cope with the opposing dilemma. Throughout this paper, consequently, the data conveyed should promote further disseminations of the interventions, as well as new outcome studies. Before the analysis of articles began, a list of conventional keywords particularly related with the interventions for student athletes was generated to find the articles.

**CONCLUSION**

Due to the various consequences of substance and alcohol abuse among athletes, through the examination of research articles of student athletes, the research was guided by the following questions: Who is directly affected? What are causes of abuse? What factors deter and contribute to the drug abuse and alcohol abuse as well as binge drinking among aspiring athletes? What implementations can be researched for possible interventions? All of these questions served as an outline to understand the issues pertaining to drug and alcohol abuse among student athletes.

Since alcohol and drug consumption have been increasing rapidly among young athletes in the entire nation, interventions, from previous research studies that were conducted for efficacy were compared for validity. By assessing the variety of interventions, a conceptual outline served as a guide to develop a solid intervention. The main idea and purpose of this research is to inspire other researchers who possess the financial means to conduct further studies in a controlled environment. Such advancement will further evolve current interventions on such over looked subject matter.

**REFERENCES**


THE RELEASE OF CALCIUM IN BACILLUS ANTHRACIS PATHOGENICITY

BY NATIERA MAGNUSON

ABSTRACT
Bacillus anthracis spores form in response to starvation and can withstand extremes of heat, radiation, and chemical toxins, making B. anthracis spores ideal vehicles for infections. The resistance and dormancy of bacterial spores are dependent on a largely dehydrated core. The spore core is not only devoid of water, but contains between 0.8 to 1M calcium complexed with 2,6-pyridinedicarboxylic acid (dipicolinic acid, DPA). The DPA-calcium complex (CaDPA) helps protect DNA, RNA, and the metabolic enzymes needed for the establishment of a vegetative cell cytoplasm. An anthrax infection starts with the germination of B. anthracis spores in a macrophage. The germinated spore can then produce toxins that eventually kill the macrophage. During B. anthracis spore germination, large concentrations of calcium ions (Ca+2) are released. Calcium ions act as a second messenger in macrophages, and it is possible that the release of these ions interfere with the macrophages ability to detect newly germinated B. anthracis spores. In this project, we will investigate the role of calcium release on infected macrophage viability.

INTRODUCTION
Bacillus anthracis is a gram-positive, spore-forming, rod-shaped bacterium. B. anthracis spores are resilient, surviving extremes of temperature, low-nutrient environments, and harsh chemical treatment. The majority of this resilience is due to three structural components of the spore: the coat, cortex, and core. The spore coat is a multilayered protein shell that surrounds the cortex. The cortex is a layer of loosely cross-linked peptidoglycan which surrounds the spore core. The spore core is the interior of the spore and contains DNA and small, acid-soluble proteins. When spores are inhaled, ingested, or come into contact with a skin lesion on a host the spores may reactivate and multiply rapidly. The vegetative form of B. anthracis releases the lethal anthrax toxin. Macrophages are white blood cells within tissues that phagocytize cellular debris. When a
macrophage phagocytizes a *B. anthracis* vegetative bacterium, the bacterium is killed. However, when a macrophage phagocytizes a *B. anthracis* spore, the spore is not killed. Instead, the spore is able to germinate into a vegetative bacterium. Toxin production is not detected until three hours after the onset of germination. During these three hours, the newly germinated *B. anthracis* cell is vulnerable to its external environment, and yet it is not destroyed.

Calcium ions act as secondary messengers in macrophages. A secondary messenger is a molecule that relays signals from receptors on the cell surface to target molecules inside the cell, in the cytoplasm, or nucleus. When a *B. anthracis* spore germinates, it releases calcium ions. It is possible that the sudden influx of calcium ions inside the macrophage, once the spore starts to germinate, can confuse the cell signaling system. This confusion may allow the newly germinated bacterium to go undetected; it then can release the anthrax toxin to kill the macrophage. The purpose of this study is to determine the effect of calcium ion release on the macrophage.

**LITERATURE REVIEW**

Pioneering work on the bacterium *Bacillus anthracis*, and its associated disease anthrax, was performed by Dr. Robert Koch in the late nineteenth century. *B. anthracis* was not considered a major threat to humans, but to livestock. However, in our current society, *B. anthracis* can be considered a significant bioterrorism threat.

An anthrax infection starts with the *B. anthracis* spore. A spore is a metabolically dormant cellular state triggered by starvation and can withstand extremes of temperature, heat, radiation, desiccation, and exposure to toxic chemicals. Despite this dormant state, the spore can sense when external conditions are conducive to germination. Germination is a committed process that occurs in five steps divided into two stages. The first stage comprises the first three steps in the germination pathway: release of monovalent cations, release of DPA complexed with calcium ions (CaDPA) and other divalent cations, and water replacing the released DPA. The second stage comprises the last two steps: hydrolysis of the spore’s peptidoglycan cortex and swelling of the spore. After stage two, metabolic activity starts signifying spore outgrowth. *B. anthracis* spores can enter the body through a skin abrasion, inhalation, or ingestion. A cutaneous anthrax infection is the most common form of infection and easily treated with antibiotics; this type of infection is rarely systemic. The digestive form of anthrax has a variable mortality rate, but can approach 100 percent. Inhalation of *B. anthracis* spores can become systemic, with a mortality rate near 100 percent.

In the inhalation form of anthrax, *B. anthracis* spores are inhaled into lung alveoli where they are then phagocytosed via the classical pathway by alveolar macrophages. The macrophage then migrates to a lymph node. The *B. anthracis* spore germinates inside the macrophage during this migration to the lymphatic system. The lymphatic system is where a vegetative bacteria lyses the macrophage, multiplies, and gains access to the systemic circulation.

Alveolar macrophages are a part of the cell-mediated immune response. They are responsible for clearing the lungs of foreign material during inhalation. Normally, macrophages destroy foreign organisms through a phagolysosome. A phagolysosome is a fusion of a phagosome and lysosome compartment. A phagosome is a membrane bound vesicle formed during the phagocytic process. A lysosome is a vesicle in the cell that contains digestive enzymes. When these two compartments fuse, the digestive enzymes from the lysosome mix with the contents of the phagosome, destroying those contents.

However, *B. anthracis* spores not only survive the hostile phagolysosome environment of the macrophage, but they can germinate into vegetative bacteria and lyse the macrophage. Time-lapse confocal imaging has shown the process of phagocytosis of the *B. anthracis* spore, germination of the spore in the macrophage, bacterial replication in the macrophage, followed by macrophage death. It has also been shown that the phagolysosome is the point of *B. anthracis* spore germination. That the digestive enzymes of the lysosomal compartment may aid in spore germination by weakening the spore coat has been theorized.

During step two of spore germination, divalent cations are released along with CaDPA. During *B. anthracis* germination, 0.8 to 1M of calcium ions are
released from the spore core.3 The eukaryotic cytosolic concentration of free calcium ions is 0.01μM to 1μM (1μM = 10-6M).14 Because calcium ions participate in signal transduction, the concentration of intercellular calcium is tightly regulated in eukaryotic cells. The typical mammalian cell has a total volume of 1pL (1pL = 10-12L).6 The average volume of a B. anthracis spore is approximately 0.003pL. From a volume of 0.003pL to 1pL, the concentration of calcium that is leaving the spore will change because of dilution. There will be an influx of 0.003M of calcium ions into the cell from the spore. This is statistically significant as it is a thousand fold increase.

METHODOLOGY

Spore Isolation
The B. anthracis Sterne 34F2 strain will be used. The Sterne strain lacks pXO2 plasmid that encodes for the capsule of a vegetative bacterium, but still has the pXO1 plasmid that encodes for toxin production. B. anthracis cells are streaked on a nutrient agar plate (1% of a 10% potassium chloride solution, 1% of a 1.2% magnesium sulfate solution, 0.1% 1M calcium nitrate, 0.1% 0.01M manganese chloride, 0.1% 1mM ferrous sulfate), and a single colony is isolated. This single colony is then grown in nutrient broth, it is incubated while shaking for four hours at 37˚C. Lawn plates are created by adding 150μL of the inoculated nutrient broth to each nutrient agar plate. The lawn plates are incubated at 37˚C for five days. After five days, each lawn plate is flooded with filter-sterilized ice cold nano-pure water and the growth is scraped and collected. The suspension is centrifuged and washed three times in filter-sterilized ice cold nano-pure water and stored at 4˚C.

Mineralization and Demineralization
The normal spores (unaltered control) are suspended in autoclaved nano-pure water at an optical density at wavelength 580nm (OD580) of 1. Optical density measures the scatter of light that the spores produce when illuminated at wavelength 580 nm, the amount of scatter is directly correlated to the amount of spores. Demineralized (H+) spores are made by slowly adding 0.035N HCl to a 5mL spore suspension until pH 4 is reached and held for four hours at room temperature. The H+ suspension is then washed three times with autoclaved nano-pure water. The suspension is then divided into four equal parts, three out of the four are centrifuged and re-suspended in different 0.05M acetate solutions (calcium acetate, magnesium acetate, and sodium acetate). The fourth will be the H+ spore suspension. The spores in acetate solutions incubate for five hours at room temperature. The spore suspensions are washed three times, then re-suspended in autoclaved nano-pure water at an OD580 of 1. Thus we will have five separate spore suspensions: normal, H+, Ca+2, Mg+2, and Na+. The normal spore suspension are the spores that have not been demineralized and remineralized, these will serve as a control. The H+ spore suspension are demineralized spores, these have not been remineralized in an acetate solution. The Ca+2 spore suspension are demineralized spores that were remineralized in 0.05M calcium acetate. The Mg+2 spore suspension are demineralized spores that were remineralized in 0.05M magnesium acetate. The Na+ spore suspension are demineralized spores that were remineralized in 0.05M sodium acetate.

Tissue Culture
The macrophage cell line that will be used in this laboratory is J774 (immortalized murine macrophages). Macrophages are stored for long periods in liquid nitrogen, and for shorter periods in an enriched medium. This enriched medium consists of Dulbecco’s modified Eagle’s medium (DMEM), 10% fetal bovine serum (FBS), 1% GlutaMAX™, and 1% Penstrep. The cells need to be split regularly to avoid overcrowding. This is accomplished by adding Dulbecco’s phosphate modified saline (DPBS) with 5mM ethylenediaminetetraacetic acid (EDTA) and scraping the cell culture flask to remove the adhered macrophages. The collected cells are washed and re-suspended in 1mL of the enriched medium. The cells that are not needed for the experiment are put into a new cell culture flask,
with fresh enriched medium, and grown in a 5% carbon dioxide (CO2) incubator at 37˚C.

To determine the volume of cells that are going to be used in an experiment, cell counting with a hemocytometer is performed. A hemocytometer is a specialized microscope slide. When viewed under the microscope, four quadrants in grid pattern can be seen. From cell counting calculations, a cell suspension of 10^6 is made. Of this 10^6 cell suspension, 50μL is allotted into each well of a 24 well plate. In addition, 500μL of the enriched medium is added to each well. The well plate is incubated at 37˚C in a 5% CO2 incubator for 36-48 hours, or until a macrophage monolayer forms on the bottom of each well.

When ready to perform the experiment, the enriched media in the well plate is replaced with DMEM and 1% GlutaMAX™ and incubated for another 1-2 hours at 37˚C in a 5% CO2 incubator. At this point, B. anthracis spores can be added. The spores are added at a multiplicity of infection (MOI) of 100. Meaning that for every one macrophage, there are 100 spores being added. In 50μL of a 10^6 suspension, there are approximately 50,000 (5∙10^4) macrophages. Therefore, 5∙10^6 (50,000 × 100) spores are needed. The spores are measured to an OD580 of 1 using a spectrophotometer. There are approximately 108 spores per milliliter at this OD. The old media is removed from the well, then 500μL of the OD580 of 1 spores and 500μL of Hyclone media is added to each well. The infected well plate is then incubated for 90 minutes at 37˚C to allow the macrophages time to phagocytize the spores. After this incubation time, each well is washed ten times with Hanks’ balanced salt solution (HBSS) to remove any extracellular (non-phagocytized) spores and a DMEM medium containing 1% GlutaMAX™, 10% horse serum, and 2.5μg/mL gentamicin is added to each well. Gentamicin is an antibiotic, it is added to ensure the death of any germinating B. anthracis spores that are not phagocytized by macrophages. There are five spore samples and each must be done in triplicate. Also, there are to be wells containing macrophages that are not infected with spores, to serve as a control for macrophage viability. These uninfected wells still undergo washing and the addition of the new media. When not analyzing the well plate under a microscope, it is to be incubated at 37˚C in a 5% CO2 incubator.

Visualization of the cells is done through microscopy. Since cells are transparent, a dye is added. First, most of the media is removed from the wells, leaving 100μL in each well. Then, 500μL of the 0.04% Trypan blue and DPBS dye is added to each well. An inverted light microscope is used for visualization. The number of dead macrophages in each well is determined at regular intervals. Dead macrophages will be easily distinguishable from living macrophages because the dead macrophages will have a different color. The cellular membrane of a dead macrophage is more permeable than that of a living macrophage, therefore more stain is able to permeate the cell body making it a dark blue. Since there are no extracellular spores, and the medium is enriched, cell death is attributed to toxin release after intracellular spore germination.

CONCLUSION
There has been much study on spore germination, B. anthracis pathogenicity, and anthrax toxicity. However, the very early stages of spore germination are not as well understood. Little is published about ion release during spore germination and the effect of those ions on the macrophage. Since cells tightly regulate their ion content, it is important to understand how the sudden influx of cations from the spore affects the macrophage.

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TOWARD A MECHANISTIC UNDERSTANDING OF NARCOLEPSY WITH CATAPLEXY

BY WILLIAM L. MCCURDY

ABSTRACT
Narcolepsy (hypersomnia) is a disorder that affects 1 in 2000 individuals in the United States and it is characterized by excessive daytime sleepiness (EDS) and cataplexy, which is a sudden loss of muscle tone. As of relatively recent years, there has been a general consensus amongst the scientific community concerning the etiology of narcolepsy as numerous studies suggest that it is caused by the deficiency of neurotransmitters called orexin-A and orexin-B (or hypocretin-1 and hypocretin-2). Research suggests that deficiencies of these proteins are related to a mutation on chromosome 6 in the human leukocyte antigen (HLA) complex which is a locus that houses genes responsible for critical immune-related responses. At this point, an explanation describing the mechanism behind the mutation of the HLA complex and how such a mutation results in a orexin deficiency remains of topic of speculation, although mechanisms regarding the specific pathophysiology have been hypothesized. The primary purpose of this research is to distinctly discuss the hypothesized mechanisms behind the pathophysiology of narcolepsy-cataplexy by presenting a review that seeks to synthesize current literature. Additionally, new technologies responsible for contributing much of the information available on the subject including current and future treatments for narcolepsy will be discussed.

Abbreviations: NC = Narcolepsy; GWAS = genome-wide association studies; CSF = cerebrospinal fluid; MHC = major histocompatibility complex; EDS = excessive daytime sleepiness; HLA = human leukocyte antigen; REM = Rapid eye movement; CNS = central nervous system; EEG = electroencephalogram; GPCR = G protein-coupled receptors;OX1R and OX2R (or hcrtr-1 and hcrtr-2) = orexin (or hypocretin) receptors; SNP = single nucleotide polymorphisms; BBB = blood brain barrier; LH = Lateral hypothalamus.

INTRODUCTION
Narcolepsy with cataplexy (NC) is a complex neurologic disorder that is characterized by excessive daytime sleepiness (EDS)—frequently
described as an insurmountable urge to sleep—often accompanied by cataplexy, which is a sudden loss of muscle tone that is often associated with strong emotions such as laughter. NC is considered complex since its onset involves the interaction of multiple genes including an unknown environmental challenge that evokes the phenotype of EDS and cataplexy. NC is estimated to affect 0.02% - 0.07%, or 1 out of every 2000 individuals in the United States [3, 12].

It has been extensively documented that in typical cases, NC does not manifest itself until adolescence [4]. Given the symptoms associated with NC, it is considered a debilitating disorder that disrupts many aspects of the patient’s life and is essentially a major cause of impaired social functioning [11]. Hallmarks of the disorder involve abnormalities in sleep regulation that result in the expedient and uncontrollable onset of REM (rapid-eye movement) and non-REM sleep at inappropriate times. Many patients find it difficult to stay active in the workforce as both securing and maintaining a job poses an overwhelming challenge to the patient as a direct result of EDS and cataplectic attacks. Additionally, driving is another challenge to NC patients as their risk for motor vehicle accidents drastically increases upon the onset of the disorder. As a result of the precarious nature of the disorder, some patients decide not to drive at all for fear that they will harm themselves or others. During daytime sleep episodes, patients often report vivid hallucinations during wakefulness of terrifying images of intruders; a phenomenon known as hypnagogic hallucinations. A case was reported where an NC patient violently assaulted his wife in his sleep. Upon examination in the ER, the wife reportedly had severe breast pain resulting from a 4 cm³ hematoma. The assault resulted in a divorce and criminal court proceedings [2].

Due to its relative prevalence and implications on other sleep-related disorders such as sleep apnea, restless leg syndrome (RLS) and insomnia, there has been an increasing interest in elucidating the etiology of NC, as more and more scientists propose that there is a genetic link between these illnesses. Additionally, research suggests that specific irregularities in the lateral hypothalamus (LH) of the central nervous system (CNS) are the cause for EDS with cataplexy as abnormalities within this region result in disruptions in the transitioning from the various stages of sleep and wakefulness. Rapid transitions to REM sleep recorded during naps in the sleep laboratory are diagnostic for narcolepsy. An electroencephalogram (EEG) is typically used as a measure to evaluate transitions between sleep stages by measuring electrical impulses within the brain [5].

OVERVIEW OF THE OREXINS
The orexin neuropeptides and their receptors were first characterized in 1998 simultaneously by two research groups who were searching for new signaling molecules. One research team led by de Lecea and Sutcliffe named the peptides hypocretin-1 and hypocretin-2 since they are found in the hypothalamus and have some similarity between the incretin family of proteins. The other group led by Sakurai, Yanagisawa, and colleagues called these same peptides orexin-A and orexin-B since they were believed to promote hunger (the term orexin is derived from the Greek word that describes appetite, orexis) [6]. As of now, the scientific community has not agreed upon the official nomenclature; however for the remainder of this paper the orexin nomenclature will be utilized.

METHODOLOGY
The structures of orexin-A and orexin-B have been elucidated. The mature 35-amino acid orexin-A and 28-amino acid orexin-B are produced upon cleavage of the proenzyme prepro-orexin. The resulting product is an orexin-A peptide that is a nonlinear molecule with two disulfide bridges. Comparatively, the resulting orexin-B peptide is a linear molecule [8]. The primary structures of the orexins are highly conserved. When comparing mice and humans, the orexin-A sequences are identical and the orexin-B sequences only differ by two amino acids and thus the human and mouse orexin B sequences are 94% identical [6, 7]. Although the specific pathophysiology behind the NC phenotype remains unknown, 90% of NC patients show significantly decreased orexin-A levels in the cerebrospinal fluid (CSF). This observation suggests that the etiology of NC is characterized by a neuropeptidal deficiency of this key protein [1].

Non-mammalian genetic systems [fruit flies (D. melanogaster), roundworms (c. elegans) and zebrafish...
(D. rerio) have also been shown to display the NC phenotype when deficient of the orexin neuropeptides. Zebra fish that do not experience REM sleep lacking an orexin receptor were shown to have fragmented sleep at night [16].

In terms of the cells that produce these neuropeptides, there are 50,000–80,000 orexin-producing neurons in the human brain [6]. Since orexin-A and orexin-B are neuropeptides, they are active when they are combined with their G protein-coupled receptors (GPCR) [7]. The orexin receptors (OX1R and OX2R or hcrtr-1 and hcrtr-2), have 7 transmembrane domains and essentially become orphans in NC patients. This means that the endogenous orexin ligands responsible for binding to them to achieve and thus facilitate a state of wakefulness are not present in high enough concentrations to bind to these receptors [6].

Etiology of Narcolepsy-Cataplexy
Research indicates that NC patients also exhibit an inherent degradation of orexin producing neurons because the patient's immune system destroys its own neurons that it should ignore. As such, symptomatic patients typically show a strong association with a mutation on chromosome 6 within the human leukocyte antigen complex (HLA), also referred to as the MHC (major histocompatibility complex). Thus it has been suggested that NC is essentially a HLA-associated disorder in that it involves genetic predisposition within and outside the HLA complex and subsequent alteration of the immune system that results in its inability to recognize self-antigens. Such a condition is referred to as autoimmunity, and it is thought that unknown environmental factors cause the immune system of individuals with certain HLA antigens to destroy their own orexin producing neurons. This hypothesis is supported by strong evidence discussed below [5]. As has been described previously, orexin levels are extremely depressed in the CSF of NC patients which is in support of the idea that NC is a neuropeptidal deficiency because of a degenerative process where the immune system selectively targets neurons that make orexin [10].

Contrastingly, NC shows many similarities to and has been compared with type-1 diabetes. Patients develop type-1 diabetes typically at adolescence usually in response to some type of bacterial/viral infection that triggers an autoimmune cascade resulting in the destruction of the pancreatic cells responsible for insulin production [28]. Since NC develops at adolescence usually after a similar environmental event occurs, it has thus been suggested that the neurons in the hypothalamus that produce orexin are subsequently targeted for destruction by the immune system after infection, which results in the patients inability to produce orexin. Autoimmunity in NC patients is believed to result in the systematic elimination of self-produced orexin neuropeptides [14]. As previously indicated, the mechanism in how the immune system targets itself is not well understood. The continued support of the autoimmunity hypothesis sets the stage for further studies that will ultimately attempt to prevent the onset of NC immunologically [10, 14].

The fact that the HLA allele most strongly associated with the NC phenotype (HLA*DQB1*0602) is seen in significant proportions in the general population, stretches this relatively simple explanation into a more complex one that involves some unidentified gene variants in addition to an unknown environmental challenge [13, 14].

Typical markers that suggest strong predisposition amongst multiple ethnic backgrounds are the HLA*DQB1*0602 allele (a MHC class II molecule) which is a mutation seen in 90% - 100% of symptomatic patients [5]. The frequency of this allele in symptomatic patients provides strong evidence in favor of the hypothesis that NC has an autoimmune etiology; however many people in the population have this allele who do not have NC symptoms suggesting that the simple presence of the allele is not the single determining factor for whether or not an individual will develop the disorder [10, 11]. Although HLA*DQB1*0602 allele is present in more than 90% of NC patients, it is in complete linkage with another allele in the MHC called HLA*Q0102 and rare haplotypes that have the HLA*DQB1*0602 allele without the HLA*Q0102 allele are asymptomatic, alluding to the possibility that these two alleles in combination are critical for disease predisposition [5]. Alternatively, some alleles such as HLA*DQB1*0603 appear to offer protection against the NC phenotype as patients with this allele were asymptomatic [5].

Model System Studies
Knockout mice lacking the orexin gene and dogs with a null mutation in the OX2R gene all have
phenotypes that are very similar to human patients with NC. Orexin peptide knockout mice exhibited severe sleepiness and were unable to maintain long bouts of wakefulness. Furthermore, NC rats and dogs displayed similar sleep habits [6]. These model organisms have significantly contributed to our current understanding of the disorder and the data gathered from them directly correlate with the postulation of an orexin deficiency being responsible for the NC phenotype. Studies concerning the specific pathophysiology of the disorder are a topic of much interest and dogs have been crossed to produce the phenotype of NC.

Mignot et al.—the research group credited for discovering the cause of NC—have identified a strong correlation between a mutation on chromosome 12 and canines with NC symptoms [1]. Based on the location of the mutation in dogs, this type of mutation is not characteristic of human narcolepsy; however the same neuropeptidal deficiency of orexin was still described in NC symptomatic dogs [1]. In other studies, the spontaneous loss-of-function mutation in the OX2R receptor also led to NC symptoms in dogs. Further support of the hypothesis came from postmortem studies of narcoleptic patients. The findings of the reports indicated that there were undetectable levels of orexin-A in the vast majority of NC patients [14].

Genome-Wide Association Studies (GWAS)

With the completion of the Human Genome Project and the subsequent advent of Genome-Wide Association Studies (GWAS), came new promises in the quest for increased understanding of the pathophysiologies of sleep-related disorders such as NC, insomnia and RLS (restless leg syndrome). GWAS, along with the continued use of model systems, forms a powerful weapon for future research involving illnesses inherently genetic in nature. GWAS, high-density single-nucleotide polymorphism (SNP) chips, and next-generation sequencing have greatly simplified the path to identifying gene variants responsible for sleep-related disorders and the possibility that other mutant alleles in other genes are responsible for some cases of NC [16]. It is the hope of many that this powerful tool will prove invaluable for the discovery of new ways to both diagnose and treat NC, including other sleep disorders in the future. Rather than using the typical familial-based linkage studies to examine gene variants correlated with NC, GWAS is an unbiased way to study complex genetic disorders that involve variants (SNPs) that can occur across a large population of unrelated individuals. This technology relies heavily on sampling methods and samples 500,000 to 1 million DNA polymorphisms (SNPs) to observe genetic trends [16].

In 2008, Miyagawa et al. confirmed the strong association between the human leukocyte antigen HLA\textsuperscript{BQ*0602} and NC, and they were able to identify an additional gene variant significantly associated with the C allele of the SNP rs5770917 in Japanese NC patients. Their results implicated an association between NC and the CPT1B and CHKB genes. This same SNP was associated with Koreans, but not with Europeans or African Americans [16]. In other GWAS studies, all cases and controls were HLA\textsuperscript{BQ*0602} positive [12]. Hallmayer et al. completed a second study that showed an association between a T-cell receptor alpha locus (TRA\textalpha locus) in NC patients [16]. This result was replicated in Asians and Caucasians, but not in African Americans. The investigators were not able to reproduce the previously discovered association with CPT1B and CHKB described in the Japanese groups [16].

Interestingly, the protein produced by the TRA\textalpha locus is the \textalpha chain of the T-cell antigen receptor \textalpha\textbeta, which directly binds to HLA molecules. This provocative discovery further supports the idea that NC is an autoimmune disease. The authors hypothesize that the TRA\textalpha isoform correlated with NC may preferentially bind to MHC molecules encoded by HLA\textsuperscript{BQ*0602} enabling researchers to provide a specific hypothesis for the pathogenesis of the disorder [16]. Given this information, a clear explanation can be postulated; however correlation alone is no substitute for controlled experimentation when the goal is to find the root cause. By using model systems, questions regarding the true effect of a gene on the NC phenotype can be evaluated in genetically altered (knockout) mice, mutant dogs, or other organisms [16].

GWAS is excellent for finding common DNA polymorphisms (SNPs) by surveying a large population. Limitations to GWAS technology...
include identifying rare variants with large effects. Exomic sequencing involves the sequencing of all the coding regions of the genome (exome). These coding regions can then be scanned for mutations. Mutations that change the sequence of a protein have a greater probability of being causative [16]. Exomic sequencing has been shown to be more useful than GWAS in identifying rare genetic variants with large effects and has been successful in finding mutations that cause human diseases, such as pancreatic cancer [17-19].

**Current Treatments**

At present, NC cases are treated clinically in a relatively nonspecific manner by the use of stimulant drugs. Modafinil (Provigil), armodafinil (Nuvigil), methylphenidate (Ritalin), venlafaxine (Effexor), clonazepam (Klonopin), and sodium oxybate (Xyrem) are the typical drugs that make up the treatment regimen of many patients with NC symptoms. Many of the before mentioned drugs are used as a means to reduce EDS and cataplexy by providing the brain with enough stimulation with the goal of inducing a sustainably wakeful state. There are many glaring problems with this philosophy for treating patients with NC. This methodology of treatment is often rendered minimally effective in best case scenarios due to the fact that it fails to address the neurotransmitter deficiency that is responsible for the symptoms in the first place. Metaphorically speaking, current treatment can be thought of as placing a band aid over a large, pulsating and festering wound. Regardless of its apparent weaknesses, modern treatment is considered the standard of care in managing NC symptoms and this is probably due to the fact that the etiology of the disorder was elucidated recently—relative to the amount of time it takes to manufacture and test pharmaceuticals. In light of current limitations in pharmacotherapy aimed at treating NC patients, many patients still decide to adhere to their prescription regimen since it is often perceived as better than receiving no treatment at all.

Other problems with current treatments involve the frequently unavoidable development of tolerance. When patients begin to develop a tolerance to their treatment regimen, the therapy becomes even less effective eventually leading to an increased dosage by the prescriber, a change to another medication altogether, or even the patient overdosing. Opponents of modern NC treatment argue that the risks associated with the administration of stimulants to NC patients may outweigh any benefit to the patient. Furthermore, other issues with the current standard of care lies in the fact that many of these drugs are controlled substances—with some of them being classified as narcotic—that have an inherently high probability for abuse. For instance, Ritalin has been traditionally known to be used by college students who seek its sleep inhibiting properties as a means to stay awake longer in hopes of gaining more study time.

Patients have also testified that once it became known that they were diagnosed with NC, they received many offers from people hoping to purchase the drugs prescribed to them. These problems will inevitably continue until a more precise method for treating NC is developed, which is a current subject of great interest in the scientific community. With GWAS, exomic sequencing, and the direct DNA sequencing of a patient’s genome becomes increasingly inexpensive, in the future individuals will have the option to order a complete transcript of their (or their children’s) genome and have it analyzed for the markers previously described ($\text{HLADQB1*0602}$ and $\text{HLADQA1*0102}$) to assess specific disease susceptibility. Additionally, clinicians will be able to personalize treatments specifically for the patient and target diseases given the patients genetic makeup; this is in essence the main idea behind personalized medicine.

**FUTURE DEVELOPMENTS IN NARCOLEPSY-CATAPLEXY THERAPY**

Given the fact that NC the most common cases of NC are caused by an orexin deficiency, it has been suggested that replacement therapies involving orexin receptor agonists (drugs that stimulate receptors) will prove invaluable to the treatment of NC symptoms until a cure is discovered [3]. At present, many research groups have undertaken this important task and are attempting to find the most effective, minimally invasive way to increase orexin concentrations while simultaneously reducing systemic concentrations. Orexin-A has been shown to have a higher affinity for both $\text{OX1R}$ and $\text{OX2R}$ receptors than for orexin-B [4, 21]. As a result of its greater affinity for both receptors and its greater stability in the blood and CSF,
orexin-A was chosen to be administered to mice and the subsequent behavioral effects on wakefulness were studied [4, 26]. Upon administration intracerebroventricularly of orexin-A to rats during the light period, investigators noticed increased wakefulness time and decreased REM and non-REM sleep time [21]. Other studies replicated the before mentioned outcome as NC mice showed increased sleep suppression, and reduced cataplectic attacks upon administration of orexin-A [22]. Orexin-A administration also had similar waking effects on cats [23].

The previously mentioned studies all involved invasive procedures to administer the replacement therapy, however another research group quantitatively analyzed the systemic concentrations of orexin by comparing two relatively noninvasive administrative methods—intravenous and intranasal administration. To analyze orexin concentrations systemically, model organisms had samples drawn from their hypothalamus (target site), liver and kidneys after both forms of administration to see how much of the protein crossed the blood brain barrier (BBB) [24, 26]. Orexin-A has difficulty penetrating the BBB, but increased levels of the neuropeptide in the CSF have been described after intranasal administration. According to the literature, intranasal administration rapidly targets therapeutics to the CNS and exhibited the highest LH concentration of orexin-A and the lowest systemic concentration in the liver and kidneys [24]. Furthermore, the combination of orexin-A with a vasoconstrictor formulation to increase CSF concentration levels in targeted areas in the brain and decrease systemic concentrations have been described [25].

It has been hypothesized that the potential side effects of intranasal administration of orexin-A should in theory be minimal considering that the neuropeptide is naturally produced in the LH of wild type organisms and provided that it is appropriately targeted to the CNS. However, NC patients taking the replacement therapy could expect to have an increased appetite for several hours after administration because orexin is known to affect hunger [7, 27]. Worst case scenario for this side effect could result in obesity in some patients, but in practice, most clinicians may choose to control these effects by simultaneously recommending more exercise, prescribing medication to suppress hunger, or by some other means. More serious side effects of intranasal administration of orexin may arise as a result of systemic concentrations of the neuropeptide in the liver and kidneys.

IMPLICATIONS OF NARCOLEPSY-CATAPLEXY RESEARCH ON INSOMNIA

Interestingly, the symptomatic opposite of NC, insomnia, is thought to have some link to the same orexin neuropeptides and their receptors. Pharmaceuticals are being designed to act as antagonists to orexin receptors to interfere with its binding to promote sleep in patients that suffer from insomnia. There is much that remains unknown about the specific roles of OX1R and OX2R in controlling sleep and arousal. Studies on knockout mice lacking OX1R showed no obvious signs of impaired wakefulness [20], but knockout mice lacking OX2R exhibited moderate sleepiness with cataplexy. This result has important implications for insomniac patients as it suggests that drug antagonists that block the OX2R receptor will promote sleep effectively, whereas drugs that block both receptors should be extremely effective [20].

CONCLUSION

In this paper, a review of the major developments in NC research, including its etiology, pathophysiology, modern and future treatments including a brief discussion of its implications on insomnia are discussed. Most of the scientific data support the hypothesis that the most common form of NC is an autoimmune disease in which orexin producing neurons are destroyed by the patient's immune system. However, this hypothesis is yet to be rigorously proven. Even though much progress has been made, many questions remain unanswered and will undoubtedly be the topic of future studies. Questions regarding the true effects of a gene on the NC phenotype, the most effective way to reintroduce the deficient neuropeptide back into symptomatic patients, and how to achieve the ultimate goal which is the immunological prevention of NC symptoms will be continually assessed and studied by the use of model organisms, more advanced pharmacotherapy developments, and with further advancements in scientific technologies.
Amidst all the data presented, the facts and hypotheses remains one clear constant: that NC is truly a complex neurological disorder that involves rare variants with large effects. It is the hope of many, myself included, that with more advancements such as The Human Genome Project, exomic sequencing, and GWAS technologies, that the dimly lit path to greater discoveries in not only NC research, but research in other sleep-related disorders, cancer research and other diseases will become illuminated and eventually lead to definitive cures. In the meantime, many patients who suffer from NC symptoms including their families eagerly await, and will greatly benefit from a more specified treatment regimen that addresses the actual neuropeptidal deficiency that lays at the heart of the problem.

REFERENCES


INFLUENCE OF RAP AND HIP-HOP LYRICS ON MALE BODY IMAGE AND ATTITUDES TOWARD WOMEN

BY LORENA MUNOZ

ABSTRACT
Rap and hip-hop music are a widely popular and accessible genre of media. Its popularity and controversial lyrics raise questions as to the effects it may have on its audience. This study proposes to investigate the influence of rap and hip-hop music body image and attitudes towards women in men. We hypothesize that exposure to rap and hip-hop music will be correlated with higher mean levels of thin-ideal appearance internalization (INT-GEN), negative attitudes towards women, and cultural expectations of masculinity compared to published normative data. Participants will be 500 male college students between the ages of 18 and 24 from a large public university. Participants will complete online measures addressing questions about their body image (e.g. drive for muscularity) and attitudes toward women (e.g. objectification and misogyny). Future research should compare the influence of rap and hip-hop music on male and female’s self-concept and attitude formation based on the gender of the artist.

INTRODUCTION
Various forms of portable media (e.g., television, movies, magazines, internet, and music players) are increasingly accessible to and used by adolescents and early adults (ages 12-24) in the U.S (American Psychological Association [APA], 2007; Ward, 2005). In fact, with the exception of print media, all other forms of media have shown a significant increase in consumption between 2004 and 2009 (Kaiser Family Foundation [KFF], 2010). For example, 8 to 18 year-olds devote an average of 7 hours and 38 minutes per day to the use of entertainment media, totaling more than 53 hours a week (Brathwaite, 2012; KFF, 2010).

The increased accessibility and use of various media exposes the average American to images and messages reflecting appropriate gender roles, appearance ideals, and cultural values. In Western culture, such as the mainstream culture of the U.S., one of the current and more visible trends across mediums is an increase in the prevalence and explicitness of sexual and objectifying references (Conrad, Dixon & Zhang, 2009; Ward, 2003). For example, a recent meta-analytic review of sexual
content in entertainment media reported a 10-fold increase in the overall rate of sexual references across mediums between 1980 and 1990 (Ward, 2003). The overabundance of media formats makes it possible to access most forms of media at any time from any location (APA, 2007; Brathwaite, 2012; KFF, 2010; Ward, 2003).

Although the majority of research focuses on women, an emerging body of research suggests that negative effects of media exposure are also seen in men. Leit and colleagues (2001) found that Western sociocultural influences of appearance underscores the importance of the male lean, muscular physique in the centerfolds of Playgirl and other male magazines. Additionally, research suggests that the male drive for attaining a muscular physique (also referred to as the drive for muscularity) can lead to males engaging in dangerous weight control behaviors, such as over exercising, dieting, and using performance enhancing drugs (Olivardia, Pope, Borowiecki, & Cohane, 2004). Negative mental health outcomes like depression and poor body image are correlated with the pressure to meet sociocultural standards portrayed in the media (Olivardia, Pope, Borowiecki, & Cohane, 2004).

One form of entertainment media that is particularly popular and replete with sexually objectifying content is music, with rap and hip-hop music being the most popular genre (APA, 2007; Farley, 1999; Hansen & Hansen, 2000; Martino et al., 2006; Raezler, 2008). The majority of music research is comprised of content analyses that focus on music videos, a medium frequently criticized for offensive, violent, and sexual content (Lynxwiler & Gay, 2000). Existing research suggests that 44-81% of music videos and 70% of rap, hip-hop, and rhythm & blues (R&B) include song lyrics with content that is sexually degrading towards women and promotes materialism, power and physical prowess (APA, 2007). Adolescents and young adults attempt to identify with the characters and themes depicted in music videos and lyrics because they portray societal expectations and standards of the optimal lifestyle (Wingood et al., 2003). Consequently, young adults often model themselves in terms of dress, character, and behavior after musical figures (Brathwaite, 2012; Martino et al.; Raezler, 2008; Wingood et al, 2005). This is problematic because the musical artists associated with rap and hip-hop music create lyrics saturated with self-objectification, misogyny, and female sexual objectification (Brathwaite, 2012; Bretthauer et al., 2006).

To date, however, relatively little research has examined the influence of music lyrics as a form of entertainment media. This may be because music lyrics are key components of music videos and therefore rarely analyzed separately (Brathwaite, 2012). However, because media is more portable and accessible, adolescents often spend several hours listening to music lyrics in the absence of the artist’s visual representation (i.e., music videos). Furthermore, the majority of research includes content analyses, and examining African American attitudes towards sexual relationships. However, little research exists on the influence of other aspects of rap and hip-hop music on its audience. The skewed body of research that investigates the psychological effects of rap and hip-hop music lyrics in adolescents and more diverse populations has left a deficit in psychological and media research (APA, 2007). Additionally, researchers focus on females and often neglect to address these influences in the male population. Given the idealized muscular physique and hyper-masculine behaviors promoted in rap and hip-hop culture, the overarching purpose of the current study is to examine the use and influence of rap and hip-hop music on the internalization of Western sociocultural ideals conveyed through rap and hip-hop music lyrics, the endorsement of misogynistic attitudes towards women, and body dissatisfaction in a diverse college male sample.

**LITERATURE REVIEW**

**BACKGROUND**

Although rap and hip-hop music emerged as a reflection of the social disparities by the black community during the 1970’s, it is now part of America’s cultural identity (Sullivan, 2003). Additionally, rap and hip-hop music is the most common musical genre enjoyed by adolescents and young adults (ages 12-24). Sullivan (2003) criticized today’s rap and hip-hop music for its abandonment of its politically charged roots. He suggests that the industrialization of its lyrical content replaced rap and hip-hop music’s original roots and evolved into a money-driven, sexually
explosive version of itself that targets a larger audience than originally intended (Sullivan, 2003). Over 40 years of research documents the potential negative influences of media exposure and mass communication on children and young adult’s attitudes and social interactions (APA, 2007; Martino et al., 2006), psychopathology (APA, 2007; Cahill & Mussap, 2007; Groesz, Levine, & Murnen, 2001; Stice & Bearman, 2001; Warren et al., 2005), development and socialization (Arnett, 1995), and sexual behaviors (Fredrickson & Roberts, 1997; Moradi & Huang, 2008). However, because media influences are often subtle, cumulative, and occur over time, their impact may be difficult to detect with qualitative or quantitative methods (Strasburger, 2004; Ward, 2005). Therefore, media research that investigates music as a medium is often limited to content analyses. Content analyses of rap and hip-hop music videos and lyrics have expressed a significant amount of misogynous messages where men objectify women. The salient themes from the songs and videos analyzed depict messages of men’s power over women and acceptance of women as sexual objects (Bretthauer, Zimmerman, & Banning, 2006; Weitzer & Kubrin, 2009).

Rap and hip-hop lyrics

Weitzer and Kubrin (2009) found that only 22% of the 403 songs analyzed in their study contained misogynous messages. The overall misogynous themes coming from their lyrical content deal with offensive messages, sexual objectification, distrust, legitimization of violence and prostitution (Weitzer & Kubrin, 2009; Bretthauer, Zimmerman, & Banning, 2006). Contemporary rap and hip-hop music depicts unequal gender roles and stereotypes of masculinity and femininity. In rap and hip-hop music, males appear as stronger, virile beings with power to subjugate women, and incapable of emotional attachment. The music industry fuels the current trend of misogyny in rap and hip-hop lyrics so it can be more marketable to the masses (Weitzer & Kubrin, 2009; Sullivan, 2003). Regardless of limiting factors associated with existing content analyses (because of their subjective nature) the conclusions illustrate the messages and most salient themes that rap and hip-hop lyrics transfer to its audiences (Weitzer & Kubrin, 2009; Bretthauer, Zimmerman, & Banning, 2006).

More than 100 studies in adolescent and adult samples demonstrate the links between media exposure and negative body image, thin-ideal media internalization, and eating pathology (APA, 2007; Stice & Bearman, 2001; Warren et al., 2005). Research suggests that the perceived failure to attain or maintain the often unrealistic media portrayals of appearance, in turn, predicts body dissatisfaction, eating pathology, dangerous weight control behaviors, and negative effects (e.g., Cahill & Mussap, 2007; Groesz et al., 2001; Stice & Bearman, 2001; Thompson, van de berg, Roehrig, Guarda, & Heinberg, 2004; Warren et al., 2005). Internalization is the unconscious process by which characteristics, beliefs, feelings, or attitudes of other individuals or groups are assimilated into the self and adopted as one’s own (APA, 2007). The internalization of Western sociocultural ideals includes assimilating Western values, practices, and beliefs into the self and adopting as one’s own.

The degree to which Western ideals of appearance perpetuated in the media influence individuals can be measured by the degree to which one feels pressure to look like mainstream American models and internalizes the ideals to be self-relevant (Stice, 2002). Internalization directly influences an individual to aspire to attain and adhere to these ideals (Thompson et al., 2004). A small body of research found that lyrical content in rap and hip-hop music has little influence on men’s attitudes toward women. Because of the popular, violent and controversial content of its lyrics, two studies chose gangsta rap and the lyrics from the rap singer Eminem to identify the influence of rap and hip-hop music on its audience (Wester, Crown, Quatman, & Heesacker, 1997; Cobb & Boettcher, 2007). In one study, Wester and colleagues (1997) exposed male college students to misogynous and non-misogynous gangsta rap. The results from this investigation failed to demonstrate a relationship between rap music exposure and misogynistic attitudes (Wester, Crown, Quatman, & Heesacker, 1997). Cobb and Boettcher (2007) found little significance for the effects of exposure to rap artist Eminem, when compared to participants without rap music exposure (Cobb & Boettcher, 2007). However, there were several limitations with these, including geographical limitations, small sample sizes and predominantly white participants. Therefore, both studies suggest that the participants are not representative of rap and hip-hop music’s
Depictions of women in Western culture, media, and rap music can have a substantial influence on behavior, affect, and one's self-concept. One study of media and sexuality revealed that exposure to Music Television (MTV) among college females was the most powerful predictor of sexual permissiveness and promiscuity (Strouse & Buerkel-Rothfuss, 1987). Johnson and colleagues found that constant exposure to rap music with violent themes resulted in a greater tolerance for violence in dating situations (Johnson, Adams, Hall, Ashburn, & Reed, 1995) and may lead to a higher degree of male acceptance of violence, including violence against women (Johnson, Jackson, & Gatto, 1995). Although this portrayal of women is not restricted to rap and hip-hop music (Sommers-Flanagan et al., 1993), these themes make up a large portion of rap and hip-hop music’s lyrical content (Bretthauer et al., 2006; Weitzer & Kubrin, 2009).
The following selections exemplify the common themes in rap and hip-hop music and the messages conveyed by one of rap and hip-hop’s most popular artists:

_Eminem featuring Dina Rea “Superman”._

...They call me superman, leap tall hoes in a single bound I'm single now, got no ring on this finger now. I'd never let another chick bring me down, in a relationship, save it b***h, babysit? You make me sick! Superman ain't savin' s***t! Girl you can jump on Shady's d**k. Straight from the hip, cut to the chase, I tell a muthaf**in' slut, to her face. Kiss my d**k, get my cash...Don't put out, I'll put you out; won't get out, I'll push you out, wouldn't piss on fire to put you out. Am I too nice?...b***h if you died, I wouldn't buy you life...That's ammo for my arsenal, I'll slap you off that barstool. There goes another lawsuit, leave handprints all across you. Don't touch what you can't grab, end up with two backhands...Put anthrax on a Tampax, and slap you till you can't stand... (Eminem, 2003).

_Culture, Media, and Male Body Image_

Existing literature on the influence of mass media and body image primarily investigates the consequences of media ideals and expectations portrayed in visual sources like magazines and music videos in female populations (Olivardia, Pope, Borowiecki, & Cohane, 2004; Bottamini & Ste-Marie, 2006; Barlett, Vowels, & Saucier, 2008). Although male body image research has received more recent attention, small sample sizes and conflicting results has left a hole in the media psychology research. Furthermore, research addressing music and music lyrics’ influence on male body image has yet to be investigated (Barlett, Vowels, & Saucier, 2008; Grammas & Schwartz, 2009; Ricciardelli, Mccabe, Williams, & Thompson, 2007). The few studies addressing male body image often use small samples of primarily white college students, and therefore lack generalizability of the findings. In other words, research has yet to come to a consensus on how media images affect males and lead to their drive for muscularity (Barlett, Vowels, & Saucier, 2008; Grammas & Schwartz, 2009; Ricciardelli, Mccabe, Williams, & Thompson, 2007).

Young Money (Lil’ Wayne, Jae Millz, Drake, Gudda Gudda & Mack Maine) “Every Girl”.

I like a long haired thick red bone, open up her legs then filet mignon-- that p***y. I'ma get in and on that p***y...go on and throw it back and bust it open like you 'sposed to... girl I got that dope d**k, now come here let me dope you... (Lil’ Wayne)

...I just wanna f**k every girl in the world...it don't matter who you is miss you can get the business... (Jae Millz, 2007).

...These hoes is God’s gift like Christmas...I like ‘em caramel skin, long hair, thick a**...my butter pecan Puerto Rican... (Gudda Gudda).
Saucier, 2008). For women, the ideal body is expected to be thin and tall, whereas for men, the ideal body is expected to be slender and muscular (Olivardia, Pope, Borowiecki, & Cohane, 2004; Bottamini & Ste-Marie, 2006; Barlett, Vowels, & Saucier, 2008). Moreover, the ideal male physique is incongruent to the actual average male body by being 8 lbs. slender and 25 lbs. more muscular (Olivardia, Pope, Borowiecki, & Cohane, 2004).

In a qualitative study, Bottamini and Ste-marie (2006) interviewed a small sample of Canadian college students to find out what they perceived as the ideal body. The researchers investigated how the participants obtained and maintained their ideal body and why the participants wanted to obtain that idealized body (Bottamini & Ste-Marie, 2006). Many male participants expressed a greater preference for having a muscular rather than thin physique (Bottamini & Ste-Marie, 2006). The preoccupation of men’s muscular ideal physique is partly attributed to the influence that mass media has over men. The distress and dissatisfaction that stems from the failure to obtain the ideal male body leads to the development of psychological disorders and behavioral changes in men (Barlett, Vowels, & Saucier, 2008). The preoccupation of men’s muscular ideal physique is partly attributed to the influence that mass media has over men. The distress and dissatisfaction that stems from the failure to obtain the ideal male body leads to the development of psychological disorders and behavioral changes in men (Barlett, Vowels, & Saucier, 2008). The preoccupation of men’s muscular ideal physique is partly attributed to the influence that mass media has over men. The distress and dissatisfaction that stems from the failure to obtain the ideal male body leads to the development of psychological disorders and behavioral changes in men (Barlett, Vowels, & Saucier, 2008).

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Research suggests that rap and hip-hop music video exposure may prime certain attitudes in female adolescents. Bryant (2008) found that after African American adolescents viewed popular rap music videos, participants were more likely to accept negative images of men, and male to female interactions. Furthermore, rap music exposure was the only significant predictor of adversarial attitudes about heterosexual relationships in a sample of African American adolescents (Bryant, 2008). Of the 144 participants, 59% reported that they tried to imitate the behaviors in the videos, 65% reported that they felt bad about the interactions between the men and women in the videos, and 58% reported that they felt bad about how women were portrayed (Bryant, 2008). Similarly, Johnson and colleagues (1995a) found a significant interaction between gender and video exposure in a sample of African American adolescents. Results indicated that after the adolescents viewed popular rap music videos that varied with regard to the level of violence, female participants exposed to the violent videos had greater acceptance of teen dating violence than those who watched the non-violent videos (Johnson et al., 1995a). Conversely, male participant’s acceptance of dating violence did not vary as a function of exposure. Therefore, increased exposure to the misogynistic lyrics in rap and hip-hop music may be more likely to affect female adolescents that males, however, with so few studies, such conclusions cannot be drawn with confidence (Johnson et al., 1995a).

Current and Future Research
Current data on male body image and the media highlights the importance of the influence of mass media on males. Psychological and behavioral consequences require further investigation to understand the pressure they feel from the media (Barlett, Vowels, & Saucier, 2008; Olivardia, Pope, Borowiecki, & Cohane, 2004). Research suggests that male and female body image are negatively
influenced by media exposure, however little research exists regarding the influence that rap and hip-hop music has on endorsement of attitudes portrayed in the popular genre’s messages. Therefore, the overarching purpose of the current study is to examine the use and influence of rap and hip-hop music on the internalization of Western sociocultural ideals conveyed through rap and hip-hop music lyrics, the endorsement of misogynistic attitudes towards women, and body dissatisfaction in a diverse college male sample.

**METHODOLOGY**

**Participants**
Participants will be 500 males age 18-24. Participants will be college students attending the University of Nevada, Las Vegas, and enrolled in undergraduate psychology courses. Participants will receive course credit for their participation.

**Measures**
Attitudes and perceptions of rap music will be measured using the Rap-music Attitude and Perception Scale (RAP; Tyson, 2005). The RAP is a 26-item instrument that measures attitudes and perceptions of rap music. The RAP scale is a tool for understanding effects of the internalization rap and hip-hop music has on youth and young adults (Tyson, 2005).

Self-perceptions of muscularity will be measured with the Male Figure Drawing utilizes nine male figure drawings to illustrate different levels of muscularity for men’s ideal body image (Lynch & Zellner, 1999).

Internalization will be measured with the Sociocultural Attitudes Toward Appearance Scale-3 (SATAQ-3; Thompson, van den Berg, Roehrig, Guarda & Heinberg, 2004). The SATAQ-3 measures the pressure for an ideal body and its influence over its audience to meet cultural standards set by the mass media.

Cultural attitudes and expectations of masculinity will be measured with the Gender Role Conflict Scale (GRCS I & II; O’Neil, Helms & Gable, 1986) measures men’s response to situations, thoughts and behaviors related to gender expectations. The GRCS question men on how they deal with expectations of money, power, relationships and their emotions (O’Neil, Helms & Gable, 1986).

**Procedure**
Data will be collected online via survey monkey. A potential advantage of collecting data from a male population on-line is an increased the likelihood of honest responding and reduce socially desirable responding, and the ability to gather data from a larger more diverse sample. Bottamini & Ste-Marie (2006) assert that males consider it demasculinizing to respond to questions about their body image to a male interviewer. In addition, there is a probability that men may feel uncomfortable talking about misogynous attitudes toward women to a female interviewer (Bottamini & Ste-Marie, 2006). After providing consent, participants will complete a demographic questionnaire along with the measures of body image and masculinity. Once all the measures are completed, participants will be fully debriefed and given course credit.

**Proposed Analyses**

1. **H1:** Participants in the sample will report higher mean levels of appearance-ideal internalization (INT-GEN), negative attitudes towards women, and cultural expectations of masculinity compared to published normative data.

   **Proposed Analysis:** Independent samples t-tests will be conducted using M (SD) from published normative samples and compared to M (SD) from the current sample.

2. **H2:** Self-reported rap and hip-hop music consumption, internalization of Western media ideals of appearance, negative attitudes towards women, and cultural expectations of masculinity and body size dissatisfaction will be positively correlated.

   **Proposed Analyses:** The strength of the relationships between variables will be tested using bivariate correlations.

The study is currently undergoing Institutional Review Board approval. Therefore, data for the study has not yet been collected.

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ABSTRACT
A Morris water maze is widely used in neuroscience to assess the effects of various conditions on memory and learning in rodents. As an important tool in drug discovery, the data stemming from its use requires careful statistical modeling. Such modeling is presented in this report using a Bayesian inferential framework. A random effects modeling approach is used to account for dependency in the data due to the repeated measurements taken on a rodent on a given day. Additionally, the censored data, which naturally occurs based on the experimental design, are treated as missing and imputed during the Markov chain Monte Carlo scheme used to examine the joint posterior distribution.

1. INTRODUCTION
Many neurological disorders manifest themselves as deficiencies in learning and memory. For example, patients with schizophrenia show memory and learning deficits [8]. To explore these deficits, biological models in animals that accurately mimic the disorder are needed. Their development would help advance our understanding of its basic mechanisms [9], which could lead to better therapies.

A popular tool for assessing learning is the Morris water maze. In it, experimental subjects learn to find their way to a hidden platform over the course of one minute, after which they are guided to the platform. This experimental design generates data that are challenging to model statistically. It leads to measurements being cut off at a certain value of time, as well as repeated use of the same subjects within a day and over days. This suggests that statistical methodology that handles both right-censored and repeated measures data will be important factors for modeling the learning phenomenon, leading to a better understanding of the differences, or lack there of, between the treatment groups. The modeling approach we take accounts for the censored data and repeated measurements within a given day\(^1\), and a Bayesian inferential approach allows examination of

\(^1\)An extension of the this model will allow for dependency in data over days and not just within days.
posterior distributions on various quantities of interest. For example, the approach we take allows for examination of posterior distributions for each rat, as well as population level parameters. This framework stands in contrast to the traditionally utilized statistical approach of repeated measures analysis of variance (RM-ANOVA) which does account for the dependency due to repeated measurements within and across days, but does not account for the censoring.

1.1 Experimental Design

A Morris water maze (MWM) is one of the most common instruments in assessment of learning and memory. It is widely employed to investigate spatial learning [13]. Therefore, it is useful in establishing effects of various treatments on the hippocampus, the area of the brain believed to be responsible for spatial navigation [4]. A MWM consists of a circular pool filled with opaque water that is divided into four quadrants. In one of the quadrants, a solid platform is hidden under the water. The subjects learn to swim toward the hidden platform as they orient themselves according to the cues on the walls. Their latency (time) to find the hidden platform along with a variety of other variables is measured using a video tracking system.

We used MWM to establish how two pharmaceutical agents, phaclophen and ketamine, alter spatial learning and memory. The literature suggests that these drugs block (antagonize) GABA_{B} and NMDA receptors in the brain, respectively. Ketamine induces psychosis in schizophrenic patients in remission [9] and produces symptoms of the disorder when administered to healthy subjects [2]. Also, ketamine impairs animals’ ability to learn spatial information [12][14][1]. Glutamate theory of schizophrenia is based on this observation [7][11]. Therefore, we expected ketamine-treated rats to have longer time of learning to find the platform. Little is known about the effect of phaclophen on learning and memory; however, GABA_{A} receptor antagonists were found to enhance retention [3]. Hence, phaclophen has been hypothesized to counteract the effect associated with ketamine.

For the course of the experiment, each rat was randomized into one of four treatment categories:
- Saline-Saline (control)
- Saline-Phaclophen
- Ketamine-Saline
- Ketamine-Phaclophen

On each experimental day, the subjects received two injections, 15 minutes apart, of each of the two compounds within a treatment category. Treatments were randomly assigned and kept consistent throughout the experiment. Immediately following the second injection, each rat performed four water maze trials. During the course of the experiment, there were three types of trials: hidden, reversal, and visible.

Each hidden trial consisted of the following: the experimenter placed a subject randomly in one of the four quadrants, and the animals were allowed to swim until they found the platform or until 60 seconds had passed. Then, they were allowed to stay on the platform for 30 seconds, after which they were placed in a warm area. After the four trials, the subjects were placed back into their respective cages.

In reversal trials, the platform was placed in the quadrant opposing that of the hidden trials. The subjects were expected to look for the platform in the previous location on the first trial and then subsequently learn the new location. In visible trials, the platform is raised above the water. The sides of the platform are thus visible to the subjects. This type of trial is performed in order to ensure that the subjects were not visually impaired.
Table 1 outlines the experimental procedures.

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<tr>
<td>15-16</td>
<td>None</td>
<td>None</td>
<td>Visible</td>
<td>Visible</td>
</tr>
</tbody>
</table>

Table 1: Types of trials performed on different days

2. LITERATURE REVIEW

2.1 Censoring

Event time data frequently encounter statistical censoring. For example, survival time data of cancer patients are prone to loss of observations if a given study stops collecting data after a certain point in time. Similarly, MWM data shows a loss of information when the latency is over 60 seconds, which leads to the data being considered right-censored in a statistical sense.

The MWM was first described in [10]. Since that time, the protocols have remained mostly unchanged, including the use of the limit of sixty seconds on the swimming time, which, as just mentioned, naturally leads to some data points being right-censored. Despite the potential for censored data, MWM data is conventionally analyzed using repeated-measures analysis of variance (RM-ANOVA) method [13], which does not take into account the censoring.

Faes et al. [5] statistically modeled MWM data in a way that accounted for the censoring using a dose-response model and a Weibull distribution. This type of analysis is most similar to our approach. However, unlike [5], we used a Bayesian inferential framework.

3. EXPLORATORY DATA ANALYSIS

Due to the features of the experimental design described above, the resulting data set presents several challenges for statistical analyses. Measurements above 60 seconds have been censored, statistically speaking, due to the limit on swimming time. Dependency within the data is present due to repeated measurements made on the same rat within a day and over days. Additionally, different numbers of days for different treatment groups were used leading to an unbalanced design.

The conventional session cut-off at 60 seconds lead to a large number of observations at this particular value (Figures 2, 3 present the data across all days and day 6 only, respectively). Due to the skewness of the response (time to find the platform), we considered a log transformation of the data (Figure 4). In the future, we will consider modeling the untransformed data directly through a Weibull distribution.
Figure 4: Log of time to find the platform without the censored data

4. MODEL

Initially let’s consider the data for day six, therefore temporarily putting aside the problem of dependency across days. However, we do account for the four repeated measurements for each rat on day 6. To reduce the skewness, we used the log transformation (see Figure 4) which shows the data points after \( \log(y)=\log(60) \) were removed. In this paper, we consider the following hierarchical model for the data for a particular treatment group \( g \) (S-S, S-P, K-S, K-P):

\[
\begin{align*}
\log(y_{i,j,g}) & \sim N(\theta_g, \sigma_g^2) \\
\theta_{j,g} & \sim N(\mu_g, \tau_g^2)
\end{align*}
\]

where \( i=1,2,\ldots,4 \) indicates the trial number within a given day, and \( j=1,2,\ldots,10 \) is the number of the subject undergoing the trial. The censored data points can naturally be thought of as missing, since we do not observe the datum that would have been obtained if a rat was allowed to continue swimming after 60 seconds for a given trial:

\[
\log(y_{i,j,g}^{\text{miss}}) \sim N(\theta_{j,g}, \sigma_g^2) \text{I}(\log(y_{i,j,g}^{\text{miss}}) \geq \log(60))
\]

For inference we considered a Bayesian approach, utilizing the following conjugate prior distributions:

\[
\begin{align*}
\mu_g & \sim N(\mu_0, \tau_0^2) \\
1/\sigma_g^2 & \sim \text{Gamma}(\nu_0/2, \sigma_0^2/2) \\
1/\tau_g^2 & \sim \text{Gamma}(\nu_g/2, \tau_g^0/2)
\end{align*}
\]

\[\mu_0=\log(30), \tau_0=\log(100), \nu_0=1, \sigma_0^2=1, \tau_0=1.\]

The prior for the population mean for each group (\( \mu_g \)) was set in the middle of the interval [0, 60] on the log scale with a variance of 100, also on the log scale. The prior sample sizes for the variance parameters (\( \sigma_g^2, \tau_g^2 \)) were set to 1 and the prior “sample” variances were also set equal to 1 [6].

In order to make inference for our unknown parameters, we examined the joint posterior distribution of the unknown parameters by conditioning on the observed data:

\[
p(\mu_g, \sigma_g^2, \theta_{j,g}, \theta_{g}, y_{g}^{\text{miss}}) = \frac{p(y_{g}^{\text{miss}}) p(\theta_{g} \mid \mu_g, \tau_g^2) p(\mu_g) p(\tau_g^2) p(\sigma_g^2)}{p(y_{g}^{\text{miss}})}
\]

As the posterior distribution is not available in closed form, a Gibbs sampling procedure was used to generate samples from the joint posterior distribution. The Gibbs sampling algorithm constructs a Markov chain in the parameters through successive draws from each of the full conditional distributions:

\[
\begin{align*}
\eta & \sim N\left( \frac{1}{n/\eta_0+1/\eta_g} [n/\eta_0+1/\eta_g]^{-1} \right) \\
1/\sigma_g^2 & \sim \text{Gamma} \left( \frac{m}{n/\sigma_0^2} + \frac{1}{\gamma_0}, \frac{1}{\sigma_0^2} + \frac{1}{\gamma_0} \right) \\
\mu_g \mid \theta_{j,g} & \sim N\left( \frac{m \theta_{j,g}}{m/\tau_0^2+\gamma_0} - \frac{m/\tau_0^2+\gamma_0}{m/\tau_0^2+\gamma_0+\mu_0} \right) \\
\mu_g \mid \theta_{j,g} & \sim N\left( \frac{m \theta_{j,g}}{m/\gamma_0^2+\mu_0} \right) \\
\mu_j \mid \theta_{j,g} & \sim N\left( \frac{\mu_j}{\mu_j} \right)
\end{align*}
\]

A Markov chain of 10,000 scans was constructed for the parameters in each of the four treatment groups, and the chain was assessed for convergence to the joint posterior distribution.

5. COMPARISON OF TREATMENT MEANS

In order to compare the population means from the four different treatment groups, we may consider the posterior probability that the population mean for group \( i (\mu_i) \) is less than the population mean for group \( j (\mu_j) \):

\[
p(\mu_i < \mu_j) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} p(\mu_i \mid y_i) p(\mu_j \mid y_j) d\mu_i d\mu_j.
\]

We are interested in high probability differences between the groups. The population mean (\( \mu \)) of
the ketamine-saline group is much higher than others. Comparison of $\mu$ for the saline-saline, saline-phaclophen, and ketamine-phaclophen groups shows that they are more similar.

The probability that $\mu$ of ketamine-saline groups is different from that of the saline-saline control is 0.987 ($p(\mu_{K-S}<\mu_{S-S})=0.987$ for day 6) (Table 2). Similarly, $p(\mu_{K-P}<\mu_{K-S})=0.737$ for day 6. Thus, phaclophen appears to counteract effects of ketamine based on the analyses of the populations means ($\mu$). These trends are also present in Figure 5, which shows latencies for days 3-6 for the different experimental groups. The trends are evident throughout days 3, 4, 5, 6, 8, and 9. However, these do not hold up for day 7 (Figure 6) and this result is currently being investigated. Due to the dependency of individual rats over days, across day comparisons are not entirely statistically appropriate. In future work we will account for the dependency over days, as well as formally take account of the platform type.

To compare swimming times (latency) for different subjects (rats), we plotted 95% credible intervals for the $\theta_g$'s over the days (Figure 7). The individual results align with the population mean results, but provide a finer grain of information and aid in an initial examination of learning by individual rats. For evidence of learning in the subjects, one may examine Figure 8. It shows that for many subjects, but not all, that the latency decreases over time. For example, subject number 11 from the S-P group, (Figure 10) consistently found the platform faster each day until day 7, when the rats were introduced to a different type of trial, the reversal trial. After day 7, the latency decreased once again. On the other hand, ketamine-saline treated (K-S group) subject number 21 (Figure 9) demonstrated near absence of learning and appeared to be performing worse after day 6.

6. DISCUSSION

In this work, we used a Bayesian framework to model the time it took rodents in a Morris water maze to find a hidden platform (i.e. latency). The statistical censoring and time dependency within experimental days was taken into account. To gain a more complete understanding of the problem, in future work we will: 1.) formally model the dependency due to repeated measures over days; 2.) utilize a Weibull distribution, which is non-negative and allows for skewness, to more reasonably model the latency data; and 3.) formally incorporate information about the platform type into the model.

<table>
<thead>
<tr>
<th>$\mu_i$</th>
<th>$\mu_j$</th>
<th>$\mu_{i,P}$</th>
<th>$\mu_{j,P}$</th>
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<tbody>
<tr>
<td>$\mu_{K-S}$</td>
<td>0.540</td>
<td>0.987</td>
<td>0.940</td>
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<td>0.460</td>
<td>0.986</td>
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<td>$\mu_{K-S}$</td>
<td>0.013</td>
<td>0.114</td>
<td>0.263</td>
</tr>
<tr>
<td>$\mu_{K-P}$</td>
<td>0.060</td>
<td>0.060</td>
<td>0.737</td>
</tr>
</tbody>
</table>

Table 2: Comparison of probabilities $p(\theta_g)$. Day 6

Figure 5: Posterior distributions for the four different treatment means for the hierarchical model. Data from day 5 through 6 are presented.

Figure 6: Means ($\mu_g$) for the four different treatment groups for the reversal trials.
Figure 7: Comparison of $\theta$ for different experimental subjects, days 3 through 6

Figure 8: Medians of latency for different subjects over the experimental days

Figure 9: Subject 11 from the control (S-S) group demonstrated learning

Figure 10: Subject 21 from the K-S group demonstrated near absence of learning

REFERENCES


REFERENCES


AN EXAMINATION OF ETHNIC DIFFERENCES IN BODY IMAGE IN MALE COLLEGE STUDENTS

BY RICARDO RIOS

ABSTRACT
Limited research examines body image in men from ethnic minority groups in the United States. This is problematic because values and ideals of appearance differ substantially across ethnic groups and cultures. Furthermore, in the U.S., the ideal appearance for men is portrayed in mainstream media as increasingly more muscular and harder to attain. Examining how men of diverse ethnic groups are influenced by the media is critical. Consequently, the purpose of this study was to examine how ethnicity identity (defined as a sense of affirmation and belonging to an ethnic group) influences body image in a sample of Hispanic (n = 71), Asian American (n = 132), and European American (n = 216) male college students. Results for the current study suggest that as affirmation and belonging influence muscle checking and muscle satisfaction. Excessive weight lifting tendencies was influenced by achievement in both European American and Asian American males. Implications for clinicians and researchers will be discussed.

INTRODUCTION
Culture is defined as the overarching belief system and value orientation of a group of individuals that influences customs, norms, and psychological processes (American Psychological Association [APA], 2003). Most cultural groups are heterogeneous. For example, Western culture broadly describes the dominant majority culture of many first world, economically stable countries, including most of Western Europe, Australia, and the United States. Similarly, the Hispanic population in the United States is comprised of individuals from a Spanish culture background that share similar values and ideals, such as strong family ties, collectivism, and interdependence (Santiago-Rivera, Arrendondo, & Gallardo-Cooper, 2002); which includes, but not limited to, individuals from South America, Central America, Cuba and Puerto Rico. In the United States, the term Asian mostly represents individuals from an East or Southeast Asian origin, such as Chinese, Japanese, and Filipinos, and excludes groups such as Indians and Pakistanis (Kennedy, Templeton, Gandhi, & Gorzalka, 2004). Although cultural terms encompass individuals from a vari-
ety of locations, individuals in these groups mostly share similar values and ideals.

An Examination of Ethnic Differences in Body Image in Male College Students
Regardless of the culture under consideration, appearance ideals are often defined by an individual’s membership in a given culture (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999). For instance, in Western cultures, considerable emphasis is placed on physical appearance as a determinant of personal and social value (Thompson, et al., 1999), with mainstream media being a major contributor in prescribing ideals of appearance. For example, in a review on body dissatisfaction across cultures, Holmqvist and Frisen (2010) found that body dissatisfaction is more common in countries that share a Western lifestyle. Even if the population is not living a Western lifestyle, Holmqvist et al. (2010) suggest that being exposed to a Western lifestyle through media, and increased identification with Western culture will likely lead to heightened levels of body dissatisfaction.

Although the connection between body dissatisfaction and Western culture is complex, many studies have noted that there is a significant relationship (Liet, Gray, Harrison, & Pope, 2002; Warren, 2008). For example, in a meta-analysis of 25 studies on how males are affected by the media to conform to muscular ideals, it was determined that pressure from the media significantly related men’s body dissatisfaction (Barlett, Vowels, & Saucier, 2008). Hence, heightened awareness and internalization of Western appearance ideals may lead to an individual feeling worst about their own body. Equally noteworthy is the media’s representation of the male body image over the decades as continually more muscular; a trend, which has been noted both in magazines (Petrie, Austin, Cowley, & Helmcamp, 1996), and in toy action figures (Baghurst, Hollander, Nardell, & Haff, 2006; Pope, Olivardia, Gruber, & Borowiecki, 1999). For example, in a study of Playgirl centerfolds, Liet, Pope, and Gray (2001) found that in a span of 25 years, the body type of male models had become increasingly more muscular.

As such, contemporary Western culture emphasizes an ideal male appearance as highly muscular, lean, and tall, with broad shoulders, a brawny chest, and a slim waist (Barlett et al. 2008; Petrie et al., 1996; Pope, Phillips, & Olivardia, 2000). With the ideal male figure becoming commercialized by the media, body ideals for men have become more unrealistic and harder to achieve by individuals (Pope et al., 1999). In fact, some have suggested that physiques presented by the media can only be achieved through the use of anabolic steroids (Pope et al., 2000). To date the, majority of research into body image and the negative influences of mainstream American media on appearance ideals has been primarily studied in women of European American (White) ethnicity. Hence, there is lack of understanding regarding body image among different ethnic groups and how exposure to Western culture impacts male body satisfaction.

Body image encompasses the attitudes and perceptions of an individual’s physical appearance, and may include their overall physical appearance or specific body features (Cash & Pruzinsky, 2002). A negative body image (being dissatisfied with one’s appearance) in men has been linked to obsessive exercise, the use of anabolic steroids, increased food supplement intake, eating pathology, depression, and low self-esteem (Calfri & Thompson, 2004; McCabe & Ricciardelli, 2003; McCabe & Ricciardelli, 2004; McCreary & Sasse, 2000; Olivardia, Pope, Borowiecki, & Cohane, 2004). Body dissatisfaction may affect men across many developmental stages, with boys as young as 6 years of age evidencing body image concerns (McCabe et al., 2004). Hence, men exposed to these appearance ideals are likely to strive to meet them as well. For example, Olivardia et al. (2004) found that college men desired a body type that was about 25 pounds more muscular than their current body type. In addition, compared to adolescents, college men have a stronger relationship between media exposure and body dissatisfaction (Barlett et al., 2008).

Ethnicity and Body Image
As stated above, there is considerable variability across cultures with regards to male body image (Ricciardelli, McCabe, Williams & Thompson, 2007). This may be partially explained by the variability among different ethnic groups concerning weight preferences (Altabe, 1998). For example, African American men, as well as Pacific Islanders, prefer a more robust body type compared to White men.
In addition, Black men have a more positive body image than White men (Ricciardelli et al., 2007). Similarly, Black women have presented a lower prevalence of body dissatisfaction and eating disorders which may be due to the culture’s positive view on larger body types (Demarest, & Allen, 2000). Hence, understanding how Western cultural appearance ideals influence members of non-white ethnic groups is important.

In contrast to African Americans, body image in members of Asian and Hispanic cultures is more variable. Research on body image in Asian and Asian American men has yielded inconsistent findings, with some studies finding Asian men having more body image concerns than Whites (Kovner, 2002; Lerner, Iwawaki, Chihara, & Sorell, 1980; Neumark-Sztainer et al., 2002; Yates et al., 2004), while others reveal no differences (Cachelin, Rebeck, Chung, & Pelayo, 2002; Franzoi & Chang, 2002; Mintz & Kashubeck, 1999). Asian culture in the United States is comprised of many groups, including but not limited to, Japanese, Chinese, and Filipinos. As such, body image concerns may vary widely depending on the region for which an individual is from. Indeed, Kennedy et al. (2004) found that body image satisfaction varied between Asian men of different descent (i.e. Chinese, Indo-Asian, and European). Still, many studies have found Asian men to be generally dissatisfied with their muscle size (Jung, Forbes, & Chang, 2007; Davis et al., 1998). Davis and colleagues (1998) found in a sample of 123 Asian men from the U.S. and Hong Kong to be generally dissatisfied with their body size, with the majority desiring a larger physique. The researchers also found that men from Hong Kong were more dissatisfied with their body but engaged in less exercise as compared to the U.S. sample. Similarly, Jung et al. (2007) found that Asian men in the U.S. and in Hong Kong- China were generally dissatisfied with their musculature. However, Asian men in the U.S. showed a higher drive for musculature and associated a more positive attitude towards musculature compared to Asian men in Hong Kong (Jung et al., 2007).

The Hispanic population is comprised of many groups that have a Spanish culture background, including those from South America, Central America, Mexico, and some Caribbean islands. The limited amount of studies on body image in Hispanic have reported that when compared to White males, Hispanic males do not differ in terms of body size preference (Cachelin et al., 2002; Cachelin, Striegel-Moore & Eldar, 1998; Gardner et al., 1999; Miller, Gleaves, Hirsch, Green, Snow & Corbett, 2000; Ricciardelli et al., 2007). However, Ricciardelli and colleagues suggested that Hispanic males are more likely to engage in binge eating, and to a lesser extent, more likely to engage in muscle gaining behaviors than White males. For example, many studies that have concentrated on an adolescent population have found Hispanics more likely to engage in extreme weight loss strategies, such as dieting and fasting (Croll, Neumark-Sztainer, Story & Ireland, 2002; Neumark-Sztainer et al., 1999; Robinson, Chang, Haydel, & Killen, 2001). In addition, some studies have reported that Hispanic adolescents more likely to engage in muscle/weight gain strategies (Neumark-Sztainer et al., 1999; Serdula, Collins, Williamson, Anda, Pamuk & Byers, 1993), as well as more likely to use steroids as a way to gain muscle mass (DuRant, Ashworth, Newman & Rickert, 1994; DuRant, Ashworth, Newman & Slavens, 1993; Irving, Wall, Neumark-Sztainer & Story, 2002).

**The Current Study**

The current study explores how an individual’s ethnic identity and feelings of belonging to their ethnic group influences body image concerns in men across cultures. Understanding the influence Western culture has on male body image is important because Western cultural ideals and values have been extensively linked to eating pathologies (Polivy & Herman, 2002; Thompson et al., 1999). However, there are notable gaps in the literature concerning body image in men, specifically in ethnic minorities. Consequently, the overarching purpose of this study was to examine ethnic differences in body image among male college students. Specifically, our goals were to 1) test mean levels of body image and endorsement of the ideal appearance perpetuated by the media by ethnic group, and 2) examine whether ethnic identity influenced the strength of the relationship between endorsement of mainstream media and body image. We hypothesized that components of ethnic identity (i.e. affirmation, belonging, and achievement) would positively correlate with body image concern in men.
METHODOLOGY
Participants
The current study consisted of Hispanic (n = 71), European American (n = 216), and Asian American (n = 132) male students attending a small southwestern university. The average age of the current sample was 21 years (M = 20.60, SD = 4.33). Participants were recruited from introductory psychology courses or from flyers posted about campus. Those recruited from psychology courses received course credit for their participation whereas those recruited from flyers received no credit for participation.

Measures
Body Image. The Muscle Appearance Satisfaction Scale (MASS; Mayville, Williamson, White, Netemeyer & Drab, 2002) is a 19-item self-report measure for the assessment of muscle dysmorphia symptoms (intense preoccupation with lack of muscle size) in cognitive, affective, and behavioral dimensions. The original scale used a 7-point Likert scale, however a 5-point Likert scale ranging from 1 (definitely disagree) to 5 (definitely agree) has been shown to yield high-quality data with few malfunctions (Chaney, 2008). The MASS includes five subscales: MASS Satisfaction (MASS-SAT: range 3-15) which is a measure of muscle satisfaction; Muscle Checking (MASS-CHECK: range 4-20) which measures muscle checking behavior (e.g., “I often find it difficult to resist checking the size of my muscles”); Substance-Use (MASS-SUB: range 4-20) which measures substance use and other risky behavior related to muscle building; Building (MASS-BUILD: range 4-20) which measures body building dependence; and, Injury (MASS-INJ) which measures propensity for injury (range 3-15). The MASS has demonstrated overlap with validated measures specific to body image disturbance such as: Social Physique Anxiety Scale (Hart, Leary, & Rejeski, 1989), Multi-Dimensional Body-Self Relations Questionnaire (Cash, 1997), Body Dysmorphic Disorder Examination Self-Report (Rosen & Reiter, 1994, and Body Image Rating Scale (Mayville, Gipson, & Katz, 1998; Mayville et al., 2002).

Ethnic Identity. The Multigroup Ethnic Identity Measure (MEIM; Phinney, 1992) consists of 14-items assessing aspects of ethnic identity. Participants rate the extent of their agreement on each item on a 4-point Likert scale ranging from strongly agree to strongly disagree (4=Strongly agree, 3=Somewhat agree, 2=Somewhat disagree, 1=Strongly disagree). The MEIM includes three subscales; Affirmation and Belonging which measures positive attitudes and sense of belonging to an ethnic group (e.g., “I am happy that I am a member of the group I belong to”; range 5-20); Ethnic Identity Achievement which measures the level of an individual’s resolution and exploration of identity (e.g., “I have a clear sense of my ethnic background and what it means for me”; range 7-28); Ethnic Behaviors which measures the individuals involvement in practices related to their ethnic group (e.g., “I participate in cultural practices of my own group, such as special food, music, or customs”; range 2-8). The current study utilized the Affirmation and Belongingness scale, which is scored by adding the responses to 5-items. Reliability coefficient for the overall scale was .90 within college students (Phinney, 1992) and .86 for the Affirmation and Belongingness scale utilized in the current sample (Phinney, 1992) suggesting it is a valid measure of ethnic identity.

Demographics. Participants provided their age, height, and current weight information. Body mass index (BMI: kg/m2) was calculated using height and weight BMI has been shown to significantly predict body dissatisfaction (Stice et al., 2002). Participants also provided information regarding the race and ethnicity they identify with, as well as their language use, and generational status.

Procedures
Male college students recruited from introductory psychology courses emailed the research team indicating an interest in participating in the study. A member of the research team sent the participant a unique link (assigning them a code) to participate in the online study. Participants went to an online data collection website (i.e., Survey Monkey) to complete measures of body image, ethnic identity, and demographic information. A similar procedure was used for males recruited from flyers with the exception of them receiving an alternative link directing them to the online data collection website.

RESULTS
Descriptive Information
Descriptive information demographic and
outcome variables for participants by ethnic group is shown on Tables 1 and 2. The average body mass index (BMI) of the males in the study was about 25 ($M = 24.95$, $SD = 5.22$), which did not differ significantly by ethnic group. The average age of participants was about 21 ($M = 20.60$, $SD = 4.35$), which also did not greatly vary among groups. With regards to body image, average scores were 9.67 ($SD = 3.83$) on the MASS-BUILD subscale, 7.24 ($SD = 2.71$) on the MASS-INJ subscale, 6.56 ($SD = 2.61$), on the MASS-SUB subscale, 7.86 ($SD = 3.58$) on the MASS-CHECK subscale, and 8.39 ($SD = 2.69$) on the MASS-SAT subscale. The average total score for the MASS was 39.75 ($SD = 10.96$). Furthermore, the average score on the Affirmation and Belongings subscale of the MEIM was 15.93 ($SD = 2.91$), 39.45 ($SD = 7.36$) for Ethnic Identity, 18.69 ($SD = 4.02$) for Achievement, and 4.77 ($SD = 1.64$) for Ethnic Behavior, within the total sample.

Relationships between Ethnic Identity and Outcome Variables
Bivariate correlations tested the relationship strength between ethnic identity and body image concerns (see Table 3). Correlations for the sample as a whole were as followed: BMI was significantly negatively correlated with muscle satisfaction. Therefore, as a participant’s BMI increased, their muscle satisfaction decreased. In addition, ethnic identity was significantly positively correlated with excessive weight lifting tendencies (BUILD), propensity for injury while exercising (INJ), muscle checking (CHECK), muscle satisfaction (SAT). The Affirmation and Belonging subscale, which measures positive attitudes and sense of belonging to an ethnic group, was significantly positively correlated with CHECK and SAT subscales.

Differences by Ethnic Group
Bivariate correlations separated by ethnicity were as followed: Results for Asian American participants indicate that the Achievement subscale was significantly positively correlated with excessive weight lifting tendencies (BUILD), and muscle checking (CHECK). Ethnic Behavior was also significantly positively correlated with muscle checking. Lastly, BMI for Asian men was significantly negatively correlated with muscle satisfaction. Hence, the higher the BMI of an Asian American male participant the less satisfied they were with their muscularity (see Table 4).

Bivariate correlation for White male participants indicated that affirmation and belonging were significantly positively correlated with muscle checking tendencies and muscle satisfaction. Achievement was significantly positively correlated with body building tendencies and age. Similarly, ethnic behavior was also significantly positively correlated with a participant’s age. Lastly, age was significantly negatively correlated with body building tendencies, propensity for injury due to exercise, and muscle checking tendencies in White males (see Table 5).

Results for Hispanic males indicate that BMI was significantly positively correlated with affirmation and belonging. Furthermore, a Hispanic male’s age was significantly positively correlated with ethnic behavior and propensity for injury (see Table 6).

DISCUSSION
The current study explored whether levels of positive feelings and belongingness to a particular cultural group was related to the development of body image concerns in a sample of 419 college students, which yielded some important results for future research and clinical practice. Preliminary results revealed that pride and feeling good about one’s ethnic membership were important aspects in males regarding muscle satisfaction and muscle checking as hypothesized. This may suggest that, for males in the study, the more pride and content with their ethnicity, the better they felt regarding their muscularity. In addition, ethnic identity achievement, which refers to an individual being secure about their ethnic identity and what it represents, played a strong part in their preoccupation to weight lifting exercise and muscle checking tendencies.

CONCLUSION
When broken down by ethnic group, Asian American males showed similar results regarding ethnic identity achievement, and its relationship with excessive exercising and muscle checking. This is consistent with Jung et al. (2007), suggesting that Asian males living in the U.S. may evidence more muscle gaining behaviors than Asian males living in Hong Kong. Regarding White males in the study, preliminary results indicated a relationship between an individual’s achievement of ethnic identity and excessive weight lifting tendencies. In contrast, Hispanic males in the study showed no
relationship between ethnic identity components and body image concerns, which was not expected. Further analysis will test as to whether results from the ethnic groups were statistically different.

As stated, higher levels of exposure to Western culture appearance ideals for minority cultures may lead to higher levels of internalizations of those ideals. Furthermore, higher levels of internalization have been associated with more body image concerns in men (Warren, 2008). Results suggest that ethnic identity may play a part in mediating these two factors. Ethnic identity has consistently been associated with a greater sense of psychological well-being among various cultural groups (Ghavami, Fingerhut, Peplau, Grant & Wittig, 2011; Smith & Silva, 2011). Further, internalization of societal ideals regarding muscularity has been related to the presence of muscle dissatisfaction within males (Grammas & Schwartz, 2009). This is especially important given that action figures popular among young males (Pope et al., 1999) and male models within an adult magazine (i.e., Playgirl) have become increasingly more muscular over time (Leit et al., 2001) suggesting that males are facing even greater appearance-related pressures from mainstream media.

LIMITATIONS OF THE STUDY
There are important limitations that should be considered regarding these data. As mentioned, ethnic groups in the United States are commonly heterogeneous. Hence, groups in our study may not be fully representative of those from other regions. For example, the make-up of Hispanics and Asians from the Eastern part of the U.S. varies from that of the Western United States. Furthermore, given that the relationship between media exposure and body image concerns has been found to be stronger in college-aged men, results from this study may not be generalizable to a non-college sample (Barlett et al., 2008). While much of the research on body image has focused on women of majority cultures, the current study supported the presence of similar appearance-related concerns within males. Therefore, prevention efforts on college campuses must incorporate programming on minority populations, including males.

REFERENCES


Table 1
Descriptive Information for Ethnic Groups

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<th>Possible Range</th>
<th>Actual Range</th>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>17 – 46</td>
<td>24.81 (4.72)</td>
<td></td>
</tr>
<tr>
<td>AGE</td>
<td>18 – 30</td>
<td>19.80 (2.15)</td>
<td></td>
</tr>
<tr>
<td>BUILD</td>
<td>5 – 25</td>
<td>9.46 (3.45)</td>
<td></td>
</tr>
<tr>
<td>INJ</td>
<td>3 – 15</td>
<td>7.42 (2.88)</td>
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<tr>
<td>SUB</td>
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<tr>
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<tr>
<td>SAT</td>
<td>3 – 15</td>
<td>7.77 (2.38)</td>
<td></td>
</tr>
<tr>
<td>Affirmation/Belonging</td>
<td>5 – 20</td>
<td>16.35 (2.76)</td>
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</tr>
<tr>
<td>Achievement</td>
<td>7 – 28</td>
<td>19.74 (3.87)</td>
<td></td>
</tr>
<tr>
<td>Ethnic Behavior</td>
<td>2 – 8</td>
<td>5.30 (1.64)</td>
<td></td>
</tr>
<tr>
<td><strong>European Americans (n = 216)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>18 – 58</td>
<td>24.72 (5.20)</td>
<td></td>
</tr>
<tr>
<td>AGE</td>
<td>18 – 43</td>
<td>20.78 (4.52)</td>
<td></td>
</tr>
<tr>
<td>BUILD</td>
<td>5 – 25</td>
<td>9.40 (3.65)</td>
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</tr>
<tr>
<td>INJ</td>
<td>3 – 15</td>
<td>7.07 (4.58)</td>
<td></td>
</tr>
<tr>
<td>SUB</td>
<td>4 – 20</td>
<td>6.24 (2.43)</td>
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<tr>
<td>CHECK</td>
<td>4 – 20</td>
<td>7.66 (3.27)</td>
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<td>SAT</td>
<td>3 – 15</td>
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<tr>
<td>Achievement</td>
<td>7 – 28</td>
<td>17.52 (3.89)</td>
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</tr>
<tr>
<td>Ethnic Behavior</td>
<td>2 – 8</td>
<td>4.32 (1.57)</td>
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</tr>
</tbody>
</table>

Note. BMI = Body Mass Index, BUILD = excessive weight lifting tendencies subscale of MASS, INJ = muscle injury subscale of MASS, SUB = substance use subscale of MASS, CHECK = muscle checking subscale of MASS, SAT = muscle satisfaction subscale of MASS, Affirmation and Belonging = attitude and belonging subscale of MEIM, Achievement = individuals resolution and exploration of identity subscale of MEIM, Ethnic Behavior = Ethnic Behavior subscale of MEIM.

Table 2
Descriptive Information for Ethnic Groups

<table>
<thead>
<tr>
<th></th>
<th>Possible Range</th>
<th>Actual Range</th>
<th>Mean (SD)</th>
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<tr>
<td><strong>Hispanics (n = 71)</strong></td>
<td></td>
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<tr>
<td>BMI</td>
<td>18 – 53</td>
<td>25.38 (6.07)</td>
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</tr>
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<td>5 – 25</td>
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<tr>
<td>INJ</td>
<td>3 – 15</td>
<td>7.03 (2.91)</td>
<td></td>
</tr>
<tr>
<td>SUB</td>
<td>4 – 20</td>
<td>7.03 (3.13)</td>
<td></td>
</tr>
<tr>
<td>CHECK</td>
<td>4 – 20</td>
<td>8.04 (3.60)</td>
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</tr>
<tr>
<td>SAT</td>
<td>3 – 15</td>
<td>8.40 (3.02)</td>
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</tr>
<tr>
<td>Affirmation/Belonging</td>
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<td>16.26 (2.98)</td>
<td></td>
</tr>
<tr>
<td>Achievement</td>
<td>7 – 28</td>
<td>19.89 (3.59)</td>
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</tr>
<tr>
<td>Ethnic Behavior</td>
<td>2 – 8</td>
<td>5.17 (1.49)</td>
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</tr>
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</table>

Note. BMI = Body Mass Index, BUILD = excessive weight lifting tendencies subscale of MASS, INJ = muscle injury subscale of MASS, SUB = substance use subscale of MASS, CHECK = muscle checking subscale of MASS, SAT = muscle satisfaction subscale of MASS, Affirmation and Belonging = attitude and belonging subscale of MEIM, Achievement = individuals resolution and exploration of identity subscale of MEIM, Ethnic Behavior = Ethnic Behavior subscale of MEIM.

References:


Table 5

Summary of Bivariate Correlations for European American Males

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<tr>
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<th>2</th>
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<td>-.15</td>
<td>-.21**</td>
<td>-.11</td>
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<td>.01</td>
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<td>-.07</td>
<td>-.01</td>
<td>-.06</td>
<td>-.09</td>
<td>-.05</td>
<td>.07</td>
<td>.06</td>
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<tr>
<td>3. BUILD</td>
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<td>-.56**</td>
<td>-.66**</td>
<td>.08</td>
<td>.12</td>
<td>.15</td>
<td>.09</td>
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<tr>
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<td>5. SUB</td>
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<td>.08</td>
<td>.03</td>
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<td></td>
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<td>6. CHECK</td>
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<td>7. SAT</td>
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</tr>
<tr>
<td>10. AFFIRMATION</td>
<td>-</td>
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<td>11. ACHIEVEMENT</td>
<td>-</td>
<td>.67**</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>12. ETHNIC BEHAVIOR</td>
<td>-</td>
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<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Note. BMI = Body Mass Index, BUILD = excessive weight lifting tendencies subscale of MASS, INJ = muscle injury subscale of MASS, SUB = substance use subscale of MASS, CHECK = muscle checking subscale of MASS, SAT = muscle satisfaction subscale of MASS, AFFIRMATION and BELONGING = attitude and belonging subscale of MEIM, ACHIEVEMENT = individuals resolution and exploration of identity subscale of MEIM, ETHNIC BEHAVIOR = Ethnic Behavior subscale of MEIM.

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

Table 6

Summary of Bivariate Correlations for Hispanic Males

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<th>7</th>
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</thead>
<tbody>
<tr>
<td>1. Age</td>
<td>-.11</td>
<td>-.07</td>
<td>-.32**</td>
<td>-.13</td>
<td>-.19</td>
<td>.04</td>
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<td>-.09</td>
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</tr>
<tr>
<td>2. BMI</td>
<td>-</td>
<td>.07</td>
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<td>-.18</td>
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<td>.25**</td>
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<td>-.15</td>
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</tr>
<tr>
<td>4. INJ</td>
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<td>.21</td>
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<tr>
<td>6. CHECK</td>
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<td>7. SAT</td>
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<td>.05</td>
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<td>10. AFFIRMATION</td>
<td>-</td>
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<tr>
<td>12. ETHNIC BEHAVIOR</td>
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</tbody>
</table>

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*p < .05, **p < .01.
THE NEED FOR SCHOOL-BASED DRUG PREVENTION PROGRAMS IN THE CURRICULUM

BY THEODORE WALDECK

ABSTRACT
Why haven't prevention programs been made fulltime in our nation's school curricula? Drugs are still a problem facing our children. Studies have proven that prevention programs are beneficial to our children. In fact, one study states that for every $150 spent per child for a program, $840 is saved in crime and healthcare costs. What would the savings be if we educated our children from kindergarten, all the way through high school, instead of one, or a couple of years? Little, if any, research has been done with this idea in mind, although Knowles (2001) believes to be effective prevention, education needs to be continuous throughout a student's primary years of schooling. Therefore, this study will examine the need for implementing school-based drug prevention programs from kindergarten through twelfth grade. This study will focus on the best school-based drug prevention programs from each age and grade group, the importance of making them available from kindergarten through the twelfth grade, and demonstrating that greater effects can be reached if continued support is provided to educate children about drugs.

INTRODUCTION
The purpose of this paper was to explain the need for implementing school-based drug prevention programs from kindergarten through twelfth grade. Alcohol, tobacco, and any other licit or illicit drugs, such as marijuana, cocaine, and prescription medications (prescription medication not being used as prescribed, more not less, yet taking more one day than less another day needs to be considered as abusing drugs) are considered a drug in this paper. Many schools have implemented drug prevention programs, but most of these programs last for a year, two, or maybe three school years. For the programs that last for two or three school years, the second and third year are merely booster session and reinforcement of the first year of education about drugs.

One of the most popular programs, Drug Abuse Resistance Education (DARE), is used in 80% of the school districts nationwide and incorporates 17 sessions of drug education over one school year. A
number of evaluations consider DARE as ineffective (Ennet, Flewelling, Ringwalt, Tobler, 1994; Tinelli, 1997; Birkeland, Murphy-Graham, Weiss, 2005; O'Neal, West, 2004). If DARE is proven ineffective, then why is it still used by school? And, if DARE is ineffective, then are schools still using DARE getting funded by local, state, or federal governments for using the program? Has DARE become an institution? These questions should be looked into for future research. They are intended, in this paper, more as food for thought. The greater question is why aren’t drug prevention programs used in every level of a student’s education each school year?

LITERATURE REVIEW
When researching school-based drug prevention programs, many prove to be effective (Durlak, 1997; Botvin, Griffin, Macaulay, Paul, 2005), even those that use booster sessions for the second and third year. A school based program targeted for first and second graders is called the Good Behavior Game (GBG) The GBG teaches discipline over the course of two year, and has reduced drug use among children as they get older. The GBG also proves to have financial benefits. When drug use in children decreases, there is less of a need for health care and a reduced propensity for individuals to fall into the judicial system. These two places are where those abusing or addicted to drugs utilize a large portion of taxpayer dollars.

Another program researched has different levels of education from kindergarten through the twelfth grade. The program is called Too Good for Drugs (TGFD), while the high school program is called Too Good for Drugs and Violence (TGFDV). For all intensive purposes, TGFDV will be recognized as TGFD, when further mentioning either program. Although the financial benefits-to-costs for TGFD proves to be positive, actual statistics of student drug consumption is not mentioned in the research. What is mentioned is students “intention” of non-use. No yearly studies, where improvements, or lack of year-to-year drug consumption were found. So it is not really known where the program has been effective or ineffective. This is important when measuring a program’s effectiveness. A program should identify what year or years are ineffective so as too change up the lessons being taught. It is hopeful that evaluations that describe these things can begin as soon as possible, so as to see if TGFD is truly an effective program, and where it may need changing.

Of the drug prevention programs researched, TGFD is the only one with a kindergarten through twelfth grade program. There are few kindergarten programs or programs that extend into kindergarten. Since drug use of students is not officially kept until sixth grade, some prevention programs still need to be used in children’s early years. This is a time when children’s minds can be molded into understanding the harmful effects of using and abusing, and their dangers. It should be noted; programs need to be age appropriate, as well as issued accordingly to the mental development of children’s minds. For instance, the GBG does not even mention drugs, yet proves to be effective in later years when adolescents’ usually decide to use drugs. Therefore, it is very important to deliver the necessary information to children and adolescents in their early years of education.

When evaluating a drug prevention program there are two important concerns when determining it as effective or ineffective. The first one is determining if the program actually fulfills its intentions or goals. Such goals can consist of the program helping in lessening binge drinking, helping in lessening arrests, or adolescents being sent to the juvenile detention center. But, the intentions of most goals asks, “Does the drug prevention program actually prevent adolescents or even adults (individuals whom went through a drug prevention program) from using or abusing drugs?” These individuals will be compared to individuals whom did not go through a drug prevention program. When doing an evaluation this group is called the control group.

The second concern of drug prevention programs is the benefits outweighing the costs to run the program. The two most important places of benefit versus cost is the lessening of health care costs because less adolescents and adults using the health care system due to less use of drugs. Are there fewer accidents with personal injury, less overdoses, less health problems over time? The other place of benefit is, not needing to use the court system. Are there less arrests for Driving While Intoxicated (DWI), less arrests for petty theft,
less arrests for burglaries, less arrests for possessing drugs, and other causes which the use of drugs involves the court system. For the time being, many individuals are getting arrested, going to jail or prison, two places that are paid by the taxpayers. For the lucky few, their town or city have drug courts so these individuals can stay out of the correction system.

The cost of administering the program(s) (teacher or special trainer and materials) and the time taken away from regular curriculum studies are the two costs to measure against the benefits mentioned above. The larger the benefit-to-cost ratio, the better the program, in terms of spending or saving dollars. This alone does not make a school-based drug prevention program effective. What it does do is prove that a program can be cost effective, meaning local, state, and federal governments can save taxpayers from footing the bill of drug users and abusers, and those whom are addicted to drugs.

After researching the matter of the GBG program being used in kindergarten, as well as first and second grade, and TGFD kindergarten program, hopefully drug prevention for kindergarten K-2nd grade can be fulfilled. For 3rd-12th grade a school-based drug prevention program called Life Skills Training (LST) should be considered for use. Why? LST is considered one of the best school-based drug prevention programs. Not to say any others are not better, but Dr. Gilbert Botvin has been working on drug prevention programs for over 30 years. More and more schools are using parts of his program. The LST Elementary School Program is for students in third through sixth grade. The program is broken down into three levels: 3rd, 4th, and 5th grade. Because some of the education in the 4th-5th grade level is different than the 3rd-4th grade lessons, it would be smart to teach some of the 4th grade lessons of the 4th-5th grade level in 4th grade, as well as teaching the 5th grade lessons of the 4th-5th grade level in the 5th grade and the 5th-6th grade lessons in 5th grade. This will allow for all 24 lessons to be given in the 3 years, 3rd-5th grade (Botvin, Griffin, Macaulay, and Paul, 2005). The following is an example of an LST elementary school lesson plan. One of these eight lessons will be taught on consecutive days, each week, or however the school administration and program coordinator see fit:

As mentioned above LST has lesson plans also for 6th-12th grade, as well. Not one evaluation has been found where LST has been used for the ten consecutive years, though, for 3rd-12th grade students, yet each level has been proven effective. Would results be even better than already are, if LST was used from 3rd through 12th grade? Because control groups do not receive drug prevention lessons, do LST and/or its evaluators believe withholding ten years of drug

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Key Skills</th>
<th>Lesson Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Esteem</td>
<td>To teach students about self-esteem and how it developed</td>
<td>Sharing thoughts and feelings; refraining from thoughts on personal abilities; demonstrating a personal skills to peers</td>
</tr>
<tr>
<td>Decision-Making</td>
<td>To teach students a simple step-by-step process for making decisions.</td>
<td>Group decision-making; sharing ideas in a small group</td>
</tr>
<tr>
<td>Smoking Information</td>
<td>To introduce the pros and cons of smoking</td>
<td>Practicing pulse taking and exercising; small group discussion; cause and effect reasoning</td>
</tr>
<tr>
<td>Advertising</td>
<td>To develop an awareness of how tobacco advertisers manipulate advertisements to entice people to smoke.</td>
<td>Analyzing ad techniques; creating counter-advertisements.</td>
</tr>
<tr>
<td>Dealing with Stress</td>
<td>To teach students to recognize stress and to practice techniques to deal with stress</td>
<td>Practicing stretching and deep breathing; finding what works.</td>
</tr>
<tr>
<td>Communication Skills</td>
<td>To teach students how feelings are communicated</td>
<td>Group discussion of feeling words and verbal communication; practicing non-verbal communication; practicing body language.</td>
</tr>
<tr>
<td>Social Skills</td>
<td>To help students learn ways of building and maintaining friendships.</td>
<td>Brainstorming/discussion; analysis of terms; sharing perceptions about friendship; drawing a bulletin board.</td>
</tr>
<tr>
<td>Assertiveness</td>
<td>To teach students refusal skills</td>
<td>Practicing &amp; analyzing different ways to say “no” practicing refusal skills in pairs; practicing in groups or in front of the class</td>
</tr>
</tbody>
</table>

Table 1 LST Elementary School Lesson Plan
prevention program(s) as unethical? Unless there are studies of using LST for those ten consecutive years, than one needs to occur. If schools are adopting to use TGFD for the thirteen years of education, then some schools are not using a program involving the GBG program and/or TGFD kindergarten and LST as well. The one major reason for not using a program or programs would probably be due to the lack of funds.

If public funding is being used to support most of these programs (some programs are privately funded, some are now being evaluated are privately funded), than why is DARE still allowed to be used if it has been proven ineffective (though many schools are dropping the DARE program)? DARE has a new program called Keeping It Real, but it is too early to evaluate this program. Many school-based drug prevention programs are probably taking a back seat to the DARE program, and schools still get government funding to use DARE. Though, this is not an issue to be taken up by this paper, it is an important matter to be researched. If government money is being wasted on such programs as DARE, this money can be used to fund other effective school-based prevention programs from K-12th grade.

There are many other school-based drug prevention programs that are considered model or show promise according to evaluations. Besides TGFD, the GBG, and LST, programs such as Project Northland, Project ALERT (SAMHSA’s National Registry of Evidence-based Programs and Practices, 2006), as well as many others can be looked into to see if they are logical choices to be used in a K-12th grade as school-based drug prevention programs. Project Northland is a program for students in sixth through eighth grade. Each year of lessons is of new information. Project ALERT is a Substance Abuse Prevention program for students in 7th-8th grades. Project ALERT for seventh grade has eleven lessons, whereas the eighth grade consists of three booster sessions.

When trying to consider a school-based drug prevention program or programs for K-12th grade students, needed is a positive evaluation demonstrating that the program works. Also trying to form is a control group making up students who do not receive any in school or structured drug prevention from K-12th grade. Is it ethically proper to purposely withhold a drug prevention program(s) from children and adolescents? There must be some school districts where students are not receiving any drug prevention programs at all in their K-12 school years. Are they to be considered as a control group? Is it ethically proper to do this, withholding drug prevention education, while giving thirteen years of drug prevention education to other students? Another issue to consider is why all students are not receiving some sort of structured drug prevention program, whether it be in school or in the community? This issue should also be researched because if students are not receiving any form of structured drug prevention in their K-12th grade school years, then local, state, and federal governments should be made accountable for this unethical doing, because it is proven that effective school-based drug prevention programs demonstrate a positive benefit-to-cost ratio. Are the students not receiving a drug prevention program from poor neighborhoods and/or high-risk areas?

A study found that drug prevention programs could save communities between $4 and $5 per student who participates in a drug prevention program. Some may say that their school cannot afford to fund a school-based drug prevention program, especially for thirteen years, but where are the federal, state, and local governments when the schools need them? Programs are showing that they are financially beneficial, as well as effective. The following are four effective school-based drug prevention programs, which yield net cost savings to society:

<table>
<thead>
<tr>
<th>Name of Program</th>
<th>Benefit-to-Cost Savings</th>
<th>Targeted Grade Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good Behavior Game</td>
<td>$35</td>
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<tr>
<td>Life Skills Training</td>
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<td>Project ALERT</td>
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<tr>
<td>Project Northland</td>
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<tr>
<td>Keepin’ It Real</td>
<td>$28</td>
<td>6-9</td>
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Table 2 School-based Drug Prevention Program Costs
CONCLUSION
When trying to consider a school-based drug prevention program or programs for K-12th grade students, a positive evaluation demonstrating that the program works is needed. In addition, forming a control group made up of students who do not receive any in school or structured drug prevention from K-12th grade is important. Is it ethically proper to purposely withhold a drug prevention program(s) from children and adolescents? There must be some school districts where students are not receiving any drug prevention programs at all in their K-12 school years. Are they to be considered as a control group? Is it ethically proper to do this, withholding drug prevention education, while giving thirteen years of drug prevention education to other students? Another issue to consider is why all students are not receiving some sort of structured drug prevention program, whether it be in school or in the community?

This issue should also be researched immediately because if students are not receiving any form of structured drug prevention in their K-12th grade school years, then local, state, and federal governments should be made accountable for this unethical doing, because it is proven that effective school-based drug prevention programs demonstrate a positive benefit-to-cost ratio.

Something often overlooked, but mentioned often by Dr. Botvin in articles about his research is the importance of implementing programs as intended. The more a program is implemented as intended, the more effective the program is. Evaluations casually mention how teachers do not implement certain parts of the program. Time seems to be the reason for not fully teaching the program as designed. Instructors need to be told that implementing the program as specified is imperative to the performance of the program. School administration should be made aware of this also, in order to decide how they are going to proceed with teaching core lessons and the drug prevention program, coincidently. According to Dr. Botvin, implementing 60% of a program can still result in some effectiveness, yet is not recommended, especially because the validity of the program will be compromised. Evaluations will speak about the lack of a program being implemented to its fullness, and less effective as could be is often mentioned, but never the loss of dollars due to this.

Based on the research, it is proposed that all students, kindergarten through twelfth grade, will receive a school-based drug prevention program. Teaching students about drugs is similar to teaching other core subjects, children and adolescents need year-after-year to get a grasp of what drugs and drug behavior is about. Putting together programs or using one that is already made for kindergartners through twelfth grade needs further research. If the results of an evaluation for a program being used over a course of one, two, or three years proves effective, and have financial benefits, than there should be no reason school-based drug prevention programs should not be used for kindergarten through twelfth grade. (Knowles, 2001; Babor, Caulkins, Edwards, Fischer, Foxcroft, Humphreys, Obot, Rehm, Reuter, Room, Rossow, Strang, 2010).

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ABSTRACT
It has been reported that homosexuality is a risk factor for males with anorexia. However, it is unclear whether it is a specific risk factor for eating pathology or just a common risk factor associated with psychopathology. If social stigmatization of homosexuality can cause general psychological suffering that expresses itself as a discomfort with sexual orientation, poor self-esteem, depression, and disordered eating, than homosexuality may act as a general risk factor in itself. It can also be interrelated to certain aspects that distinctively increase the risk for developing anorexia, such as increased identification with the female gender role (Murnen & Smolak, 1997) or even an amplified pressure to maintain a thin physique in order to attract a male partner (Epel, Spankos, Kasl-Godley, & Brownwell, 1969). The identification of risk factors for the development of body image disturbance and anorexia has been an active area of interest (Thompson & Smolak, 2001). Recently there has been much investigating into the causes of anorexia in females ageing from childhood all the way to adulthood, but the same cannot be said for males or why there is an increased number of homosexual males whom suffer from this disorder. This is why it is so important to expand our research for gender-specific factors for boys and males and how sexual orientation plays a part in this.

INTRODUCTION
Anorexia nervosa is classified as a serious mental disorder depicted by unbecoming low body weights, a relentless pursuit of thinness, and distorted cognitions about body weight and shape. Anorexia nervosa generally begins during middle to late adolescence. However, this previous statement has described this onset in prepubertal children and older adults; anorexia nervosa also has an elevated mortality rate. Anorexia was first discovered by one of Queen Victoria’s personal physicians, Sir William Gull in 1873 (Gull WW, September 1997); although, Richard Morton is credited with being the first physician to use medical descriptions of this condition in 1689 according to J.M.S. Pearce, 2004. From this same author, there were reports that describe anorexia symptoms during religious fasting in the Hellenistic era in 323 BC to about 146 BC.
Definition
The DSM-IV lists four criteria for the diagnosis of anorexia nervosa:
1. Refusal to maintain body weight at or above a minimally normal weight for age and height
2. Intense fear of gaining weight or becoming fat, even though underweight
3. Disturbance in the way in which one's body weight or shape is experienced, undue influence of body weight or shape on self-evaluation, or denial of the seriousness of the current low body weight
4. In postmenarchal females, amenorrhea (i.e., the absence of at least three consecutive menstrual cycles). (American Psychiatric Association. 2000).

In addition, the DSM-IV describes two subtypes of anorexia nervosa; the restricting subtype includes eating behavior characterized by the restriction of type and quantity of food without binge eating or purging behaviors. The binge-purge subtype involves binge eating and/or purging behaviors such as the misuse of laxatives or vomiting after a meal.

Literature Review
For this proposed objective of this literature review, the scope of this paper will be limited to a discussion of the accessibility of research available on this specific topic. Do to the shortage of supporting data on anorexia that is unfortunately different for males of any sexual orientation, focuses mainly on the female population only. It is unviable to exemplify a comprehensible association that works both genders and how their sexual orientation could influence this. Anorexia nervosa is often undiagnosed in males do to the perpetual escalation in the prevalence of eating disorders amongst adolescent boys of different sexual orientation over the last 30 years (Raphael & Lacey, 1994). As the characteristics of the afflicted population are changing and adapting, so too are the theories about what actually initiates this illness.

Even though eating disorders affects everyone, there is very little literature and treatment options to address issues that are specific to the male eating disorder community. Unfortunately, there has always been, and still is, an element of shame in being someone with any type of eating disorders such as anorexia. It is even harder for men to admit they have this disorder due to the old misconceptions that they cannot suffer from an eating disorder since it is considered a female disorder. The shame they face can often be much worse for men, making it harder to help them seek treatment.

According to Arnold Andersen (1990), while women develop anorexia feel fat before the onset of their disordered eating behaviors typically they are near average weight. This differs from males who are more typically overweight medically before the development of this disorder. In addition, men who are binge eaters or compulsive overeaters may go undiagnosed more than women because of society’s willingness to accept an overeating and/or overweight man more-so than an overeating or overweight woman.

Another problem affecting males with anorexia is their sexual orientation as the male gay community places a lot of pressure on the importance of successful appearance. This statement is not meant to make light on the fact that there are still many heterosexual males who still suffer as well. A consistent finding in Western countries is that homosexual males are more at risk to developing an eating disorders than heterosexual males; as eating disorders in homosexual males and disordered eating attitudes, are considerably more common than heterosexual men (Andersen, 1999; Brand, Rothblum, & Solomon, 1992). During Hospers and Jansen’s 2005 study that involved two groups of males with anorexia, one being of heterosexual males and the other group of homosexual males, found that the relationship between peer pressure and body dissatisfaction was significantly more prominent among homosexual males. In addition, there may often be shrouds of secrecy because of the lack of therapy groups and treatment centers offering groups specifically designed to treat males. Males may feel very alone at the thought of having to sit with a group of women to be part of a program designed for women, and even at the prospect that a treatment facility will turn them down because of their sex.

Men who participate in low-weight oriented sports such as jockeys, wrestlers and runners are at an increased risk of developing an eating disorder such as anorexia. The pressure to
succeed, to be the best, to be competitive and to win at all costs, combined with any non-athletic pressures such as family or relationship issues in their lives may help to contribute the onset of anorexia.

There are many possible co-existing psychological illnesses that can be present, such as depression, anxiety, post-traumatic stress disorder, self-injury behavior, substance abuse, obsessive-compulsive disorder, and borderline personality disorder and multiple personality syndrome according to Boroughs, M., Thompson, J.K. (2002). Also according to these authors, most of the underlying psychological factors that lead to anorexia is the same for both men and women such as low self-esteem, a need to be accepted, depression, anxiety or other existing psychological illness, and an inability to cope with emotions and personal issues. People with eating disorders no matter their sexual orientation or gender deserve to find recovery and the happiness and self-love on the other side.

**Prevalence**

Males who obtain eating disorders differ from females in three main areas of extreme dieting behaviors according to Anderson (1992). The first incorporates the reasons for dieting. Anderson posits that females diet, because they feel overweight; whereas males diet due to having been overweight at some point in their lives. Second, males more often than females diet to achieve specific goals in sports such as jockeys, dancers, and wrestlers. Third, there is a greater pervasiveness of men who diet to avoid medical problems; since males may think that dieting and exercise will help them feel more in control and more masculine. This may lead to more respect from others such as family and peers.

**Male Characteristics**

Males with anorexia convey that 5-10% of the population that are diagnosed with anorexia nervosa (Alexander-Mott, 1994; Anorexia Nervosa and Related Eating Disorders, 1998). However, these estimates may be inaccurate as this disorder is most likely to be underreported and misdiagnosed in males. This is due to the fact that existing literature includes various explanations, causes, treatments, and prevention of anorexia nervosa. Some clinics even refuse to treat males for this disorder. However, in spite of the voluminous articles, books, and papers written on this specific topic, there is little reference or insignificant information is made about males or their sexual orientation.

There were no studies of eating disorders in early adolescent homosexual males and most research on predictors of eating disorders was based on a purely female samples. Accordingly, there were no studies of eating disorders in early adolescent homosexual males and that most research on predictors of eating disorders were based on female samples as well. According to Keel, Fulkerson, and Leon (1997), they stated that these results may not generalize to homosexual males or males in general. In fact, there may be other unknown factors on the subject of inadequate body image, low self-esteem, and the resulting eating disorders in homosexual males.

Even though eating disorders affect everyone, there is very little literature and treatment options to address issues that are specific to the male eating disorder community. Unfortunately, there has always been, and still is, an element of shame in being someone with any type of eating disorders such as anorexia. It is even harder for men of any sexual orientation to admit they have this disorder due to the old misconceptions that they cannot suffer from an eating disorder, as it is a female only disorder. The shame they face can often be much worse for men, making it harder to help them seek treatment.

According to Arnold Andersen (1990), while women develop anorexia feel fat before the onset of their disordered eating behaviors, typically they are near average weight. This differs from males who are more typically overweight medically before the development of this disorder. In addition, men who are binge eaters or compulsive overeaters may go undiagnosed more than women because of society's willingness to accept an overeating and/or overweight man more-so than an overeating or overweight woman.

Another factor affecting males with anorexia is their sexual orientation as the male gay community places a lot of pressure on the importance of an attractive outward appearance. This statement is not meant to make light on the
fact that there are still many heterosexual males who still suffer as well. In addition, there may often be shrouds of secrecy because of the lack of therapy groups and treatment centers offering groups specifically designed to treat males. Males may feel very alone at the thought of having to sit in a group of women, to be part of a program designed for women, and even at the prospect that a treatment facility will turn them down because of their sex.

Men who participate in low-weight oriented sports such as jockeys, wrestlers, and runners are at an increased risk of developing an Eating Disorder such as Anorexia. The pressure to succeed, to be the best, to be competitive and to win at all costs, combined with any non-athletic pressures such as family or relationship issues in their lives may help to contribute the onset of anorexia.

There are many possible co-existing psychological illnesses that can be present, such as depression, anxiety, post-traumatic stress disorder, self-injury behavior, substance abuse, obsessive-compulsive disorder, and borderline personality disorder and multiple personality syndrome according to Boroughs, M., Thompson, J.K. (2002). Also according to these authors, is that most of the underlying psychological factors that lead to anorexia is the same for both men and women such as low self-esteem, a need to be accepted, depression, anxiety or other existing psychological illness, and an inability to cope with emotions and personal issues.

Lakkis, Ricciardelli, & Williams, (1999) found that homosexual males have a significantly higher level of eating disturbance and body dissatisfaction than their heterosexual counterpart. An increased level of eating disturbance and body dissatisfaction, fueled by the possibly increased value of thinness may be largely responsible for the distressed eating patterns found in homosexual males (Andersen, 1999).

There is also very little research available on how sexual orientation affects these rising numbers in males, even though there is a strong correlation between Anorexia and homosexual males. This correlation needs to be further verified to see what role, if any, that could be increasing this problem in homosexual males, if it requires a more specific type of treatment, and what can be done to give them access to the appropriate information on the harmful and deadly risks of anorexia.

**Assessment**

Carlat & Camargo (1991) stated that 10-15% of those who suffer from anorexia are male, and homosexuality appears to be a unique risk factor for eating pathology in males. Also according to these authors, 10-42% of anorexic males have identified themselves as homosexual or bisexual which is an overall higher rate than heterosexual males with anorexia. It was reported that 2.1% of homosexual males have had a past eating disorder whereas heterosexual males only reported a 0.53% (Seidman & Rieder, 1994).

**Treatment**

To treat anorexia nervosa, it is important to develop healthy eating habits that will lead to weight gain; although, some of these individuals will have to be forced to gain weight through hospitalization and/or tubal feeding. Then once the starvation progression is reversed, psychotherapy can begin to address the psychological problems that lead to the eating disorder. Therapy for anorexia nervosa can reduce negative and damaging thoughts and even changes behaviors. Anti-depressant or anti-anxiety medication can also be advantageous; since these medications can assist the recovery process and make re-feeding a less traumatic experience.

Male anorexia nervosa is an ongoing and growing problem that requires respect from the mental health and medical practitioners. Even though, it may not be as common as other psychiatric disorders, it is imperative that these mental and medical professions become familiar with anorexia in both males and females.

**SUMMARY OF FINDINGS**

There still remains a great need for more research in this area involving both clinical and subclinical populations, and in particular studies that will explain why homosexual males are more susceptible to anorexia and body displeasure. There has been a lack of research done on males who suffer from anorexia in general, let alone research explaining the rise of anorexia in homosexual males in particular.
It is important to remember the differences that may occur in homosexual communities and how these possible interactions with a variety of other variables can affect them differently than that of heterosexual males with anorexia. It is only when we understand all these variables better that we can truly begin to successfully treat these individuals and provide a system for their therapists and other physicians.

It would also be beneficial to be able to provide those who work with the homosexual youth the information and tools that they need to assist in the prevention of the origins of maladaptive behaviors in order to prevent future generations from suffering. People with eating disorders no matter their sexual orientation or gender deserve to find recovery and the happiness and self-love on the other side.

REFERENCES


AN ANALYSIS OF THE HISTORY AND HARDSHIPS EXPERIENCED BY GIRLS IN THE LAS VEGAS JUVENILE JUSTICE SYSTEM

BY ANA ZUNIGA

ABSTRACT
Previous research has defined several factors as predictors to juvenile delinquency. Characteristics among youth involved in criminal behavior include various home placements, running away, mental health problems, physical and sexual abuse, delinquency history, and family members with a delinquent background. These factors were analyzed in the current to observe whether the predictors were relevant to girls detained in the Las Vegas juvenile justice system. While observing the data in this study, it appeared that predictors described in previous research were in fact present among this population. However, further research should take an in-depth look at these factors in order to determine whether they could be deemed predictors among the Las Vegas youth.

INTRODUCTION
The purpose of this study is to analyze the hardships girls in the Las Vegas juvenile justice system have experienced. There are several hardships, such as family felony history, history of abuse, and mental health disorders which, in previous research, have been considered predictors of delinquency and running away (Alltucker, Bullis, Close, & Yovanoff, 2006; Thompson, Bender, & Kim, 2011, Welch-Brewer, Stoddard-Dare, & Mallett, 2011). Mental health issues have also been shown to be predictors of suicide attempts among youth in the criminal justice system (Putnins, 2005). The youth’s home placement has been said to be a “strong predictor” of involvement in criminality at an early age (Leve & Chamberlain, 2004, p. 449). Other research has expressed that while males usually experience more violent abuse, females experience more sexual abuse (Ryan, Kilmer, Cauce, Watanabe, & Hoyt, 2000; Thompson, Bender, & Kim, 2011). The results of this study show that the majority of girls in the Las Vegas juvenile justice system have had a family member in jail or prison. Half of the girls reported being victims of physical abuse and more than half reported emotional and sexual abuse. While very few girls stated they had bad mental health, close to half of the girls had been diagnosed with a mental illness. The results of this study also revealed that three fourths of the
girls admitted to having run away from their home at some point, some of those girls were as young as eight years of age when they first left their home. This study did not take an in-depth look at these hardships to be able to deem them predictors of delinquency among Las Vegas youth. However, it was important information to analyze in order to understand the characteristics of girls who fall victims to criminal behavior. This is especially true when these characteristics are present in nearly half of the detained girls.

LITERATURE REVIEW

One thing youth in juvenile detention have had to deal with is the idea of suicide as an answer to their troubles. In Australia, Putniñš (2005) surveyed 900 youth in detention regarding suicide attempts and thoughts. Putniñš found that suicide attempts were associated with substance abuse, "ADHD signs, and depression" (p. 149) and that females were about two times as likely to have suicidal thoughts and attempts as males. The participants were contacted to do a follow up survey where results indicated that neither depression nor previous suicidal thoughts and attempts (based on the first assessment) predicted future suicidal thoughts and attempts. However, reports of having signs of ADHD and frequent substance abuse from the first assessment did predict later suicide attempts. It is important to note that youth in detention may not be receiving the attention they need when they are incarcerated and that studies like Putniñš, regardless or country of origin, show that the youth in juvenile detention centers have a lot more to deal with than a criminal offense on their record. The current study asked girls if they had ever considered or attempted suicide; but there was not a follow up analysis of girls who stated they had attempted suicide or considered it. While suicide may not always be a consideration to all youth, there are several youth who may consider leaving their homes.

Thompson, Bender, and Kim (2011) investigated whether male and female runaways differed in abuse experienced, depression, and reasons for leaving their home. Out of 197 participants ages 11 to 17, they did not find a significant difference between males and females regarding levels of "physical abuse, sexual abuse [or] neglect" (p. 38). Thompson et al. discussed that this data is perhaps different from previous research because they focused on runaway youth rather than a "general population" of youth (p. 44). They also found that males had significantly greater levels of depression and females had significantly higher levels of emotional abuse. While both males and females attributed their depressive symptoms to negative relationships with their families, females’ depressive symptoms were also greatly due to conflict in their homes and sexual abuse. Lastly, Thompson et al. noted that while males listed violent abuse, substance abuse, and criminal behavior as the top three reasons for leaving their home, females listed sexual victimization, assault, and academic problems. The current study only asked whether girls had ran away, but it is good to also understand that youth who run away usually run to try to escape negative environments.

Ryan, Kilmer, Cauce, Watanabe, and Hoyt (2000) analyzed several factors in 529 homeless youth and how they related specifically to the type of abuse, if any, that the youth had experienced. The types of abuse in their study included physical abuse, sexual abuse, physical and sexual abuse, or no abuse. The only difference noted between males and females was that males reported more physical abuse and females reported more sexual abuse. There were two major differences between youth who had not been abused and the youth who had experienced any type of abuse. One difference was that more youth who were abused reported having mothers with alcohol and drug problems. The second difference was that those who were abused tended to internalize their problems. Ryan et al. found that the youth who had been physically and sexually abused reported being abused at a younger age than those who were physically abused. They also found that youth who were physically and sexually abused had been victimized by more individuals than those who were sexually abused. Physically abused youth, as well as physically and sexually abused youth, were more likely to be abused by their family members than sexually abused youth. While abuse among the youth did not predict depression, there were "significantly higher levels of depression [and] anxiety" among youth who had been physically and sexually abused (p. 345). This data is important for the current study because it gives insight into the differences among abused youth. While the current study only analyzed whether girls in juvenile justice system had been abused, Ryan et
al.’s research indicates that a more specific analysis of abused youth could help better understand how to help the youth in detention centers.

Welch-Brewer, Stoddard-Dare, and Mallett (2011) investigated whether race, substance abuse, or mental health disorders had any influence on delinquency involvement in 341 youth involved in juvenile court. Welch-Brewer et al. found that race was not significant to delinquency factors, including time spent in detention, number of offenses, or number of convictions. They also found that substance use did not significantly predict felonious convictions or how long a youth was on probation. What was significant in their research, however, was their data on mental health. While Welch-Brewer et al. found that male and females’ most common mental health disorder was ADHD, they found that females’ second most common disorder was depression and that males’ was conduct disorder. They explained that mental health was a predictor of “probation services” for males. They also discovered that the girls with mental health disorders tended to spend more time in detention and were detained for committing more offenses. This research is valuable to the current study in that it reveals how mental health issues in females could affect the girls’ involvement in the juvenile justice system. There are also other factors, however, that should be noted as helpful to understanding youth criminality.

Leve and Chamberlain (2004) reviewed whether parental transitions, severe punishment, and sexual abuse were relevant and significant variables correlated to the age in which girls were involved in delinquency. Parental transitions referred to the number of homes the youth lived in prior to the age of 13; severe punishment measured whether punishments the youth endured lead to physical marks or injuries; lastly, sexual abuse referred to sexual activity prior to age 13. While measuring parental transitions, Leve and Chamberlain also measured the youths’ biological parental criminal history. They noted this information was valuable because this data “represents a genetic... and environmental risk” the girls faced and undoubtedly affected the youths’ home placement (p. 445). Based on these findings, the parents’ criminal history and resulted “parental transitions” could be good indicators of an “early onset” of delinquency in young girls, regardless of the definition of “early onset;” whether the first arrest occurred prior to age 13, age 12, or the girl’s menstrual onset (p. 449). While the current study did not gather detailed information about home placements, punishment severity, or family criminal history, understanding the predictors set out by Leve and Chamberlain could help to understanding the importance of the girls’ background as it relates to their involvement in delinquency. This research is supported by Alltucker, Bullis, Close, and Yovanoff’s (2006) research.

In their study, Alltucker et al. (2006) examined 531 participant’s experience in foster care, their families’ felonious background, the youth’s special education and their socioeconomic status to learn if these factors differed among “early start... and late start juvenile delinquents” (p. 487). They found that socioeconomic status and special education disabilities were not significantly related to the age at which youth became involved in delinquency. They also found that youth who had previously been in foster care were four times more likely to be involved in delinquency at a much earlier age than those who had not been in foster care. Also, they discovered that the youth who had family members who had been convicted of a felony were twice as likely to begin delinquency earlier than those without family members with felony convictions. The participants in the current study were asked to answer questions regarding their foster care experience and their family members’ delinquency background. Alltucker et al.’s research reinforces the importance of this information when analyzing data about youth in detention.

In a later study by Leve, Chamberlain, and Reid (2009), treatment and care programs in Oregon were examined. The 105 girls who participated in the study were between the ages of 13 and 17 and had criminal referrals within two years of the study. Each girl was randomly placed in one of two groups. The first group was the experimental group in which girls were put on individualized intervention plans, had daily contact with a well-trained case manager, received individual and family therapy, had access to an on-call staff member and psychiatrist if needed, and their school attendance and performance was closely
monitored. The second group of girls was the control group and those girls were admitted into already existing programs in Oregon. The girls were given an assessment prior to the treatment programs’ start and there were no significant differences between the girls in the experimental and control groups. After completing the programs, girls were given a follow-up assessment. Although there were inconsistencies in the assessments due to self-reporting, results of the follow up assessment showed that girls in the experimental group had significantly fewer criminal referrals and spent fewer days in “locked settings” (p. 4). Leve et al.’s study is relevant because it reveals how to properly make use of the knowledge about predictors of delinquency in youth. Implementing such programs could potentially reduce the youths’ future involvement in delinquency. Based on previous research, it was expected that the majority girls in the Las Vegas juvenile justice system would report experiencing hardships that the research has declared to be predictors of delinquency in youth.

METHODOLOGY
Dr. Alexis Kennedy and the students in her research lab collected data for the Clark County Department of Juvenile Justice Services as a grant requirement for the Juvenile Detention Alternatives Initiative. This paper describes some of the hardships that these girls reported from these interviews.

Participants included 161 girls who were detained in the Clark County Juvenile Detention Center (CCJDC) between March 2007 and April 2008. The participants’ age ranged from 12 to 19 years of age (mean: 15.76; SD: 1.24). There were 9 eighteen-year-olds and one nineteen-year-old in the juvenile detention center. While no longer minors, they would have been under 18 at the time of the original arrest. Of those 161 girls, the majority of girls were African-American (52%), followed by non-Hispanic Caucasian (30%), Hispanic (25%), American Indian (9%), Asian (2%) and other (2%). The girls who indicated their racial category as “other” considered themselves part of three categories or more, or of a single ethnic group (such as Indo-Asian).

A survey was administered privately one on one with each girl to encourage the greatest level of honesty possible. Each survey covered several different areas ranging from personal background to family information and history. This study includes an analysis of the girls’ home placement and running away history, mental health background, physical and sexual abuse, and finally their own and their family members’ criminal history.

DATA ANALYSIS
Home Placement and Running Away
When asked whom they were living with at the time of the survey, girls indicated they lived with their mother (56.6%), with both parents (12.4%), with a grandparent (9.3%), with their mother and their mother’s partner or spouse (8.7%), with their father (4.3%), with a friend or roommate (3.7%), in a foster or group home (5.7%), with their father and their father’s partner or spouse (2.4%), with other relatives (1.2%), and with their adopted family (1.2%); and two girls stated they were on the run (1.2%). Most of the girls said their relationship with the person or people they lived with was good (59.2%) or very good (34%) while fewer girls stated their relationship was bad (9.2%) or very bad (2.6%); and 15% stated the relationship was fair. The girls were also asked by whom they were raised. To this, the most common response was by just their mother (40%), followed by both parents (20.6%), grandparents (14.4%), someone who was not a family member (9.4%), their mother and the mother’s partner or spouse (6.3%), just their father (8.1%), their father and their father’s spouse (6%), and other relatives (6%). Out of the 161 participants, 65.2% reported they were never taken away from their parents, while the remaining 34.8% stated they were. Not all participants answered whether they had been placed in Child Haven, which has been the most common child protective placement for children in Las Vegas who have been taken from their homes. However, out of the 126 girls who did answer this question, 22% stated they had been in Child Haven. Ninety-four of the participants (58.4%) reported never having been in foster care nor a group home, 30.4% reported having been in either a foster or group home, and 11.2% reported being in both a foster and group home. Out of the 67 girls who reported having been placed in foster or group homes, 62 reported their age at first placement. More than half of those girls (56.5%) were placed in a home before reaching age 14 and the most frequent age of
placement was age 13 and 14 (58.8%). Only 61 girls reported the number of different homes with the average being 3.74 homes and the most common answer being a foster/group home placement (54.1%). Despite being happy with their home placement prior to their incarceration, 75% of girls reported that they had run away from home at some point. On average, girls ran away from home 7.87 times (median: 5; SD: 8.827), with most girls running away a total of three times. Refer to Chart 1 to see at what age girls ran away from home for the first time.

Chart 1: Age at First Time Running Away

- 8-10: 3%
- 11: 10%
- 12: 10%
- 13: 19%
- 14: 19%
- 15: 13%
- 16-17: 7%

Mental Health
It is interesting to note how the girls in the juvenile detention center rated their mental health. Only 9% reported having bad or very bad mental health, 23.2% reported having fair mental health, and more than half (67.8%) reported having good and very good mental health. All the while, 27% reported having been hospitalized due to their mental health, nearly half (44%) reported that they had been diagnosed with a mental illness, and about half (51.3%) stated they had received counseling. Out of those who reported that they were diagnosed with a mental illness, the most common reports were bipolar, depression, and ADD or ADHD. When asked if they had felt sad or depressed in the last thirty days, 81% of the girls responded yes and 55% of them stated they had talked to someone about it. The girls were asked if they had ever thought about harming themselves or committing suicide. They were also asked about their family’s history with attempting or committing suicide. Refer to Table 1 for this data.

Physical and Sexual Abuse
Half of the girls reported witnessing domestic violence when they were growing up. Half of the girls also reported that they had been physically abused. The most frequent answers given when asked by whom they were abused were by their father, mother, current or ex-boyfriend or girlfriend, their mother’s current or ex-partner or spouse, and a sibling. When asked if they had emotionally abused, over half of the girls (62.9%) answered “yes.” More than half of the girls stated that they had been sexually assaulted or raped (52.8%). Most of the sexual assaults that occurred were reported to have been by an uncle, their mother’s current or ex-partner or spouse, a stranger, a boyfriend or ex-boyfriend, or an acquaintance. Less than half of the girls (41%) reported having been sexually abused; most of which reported being abused by a stranger, their mother’s current or ex-partner or spouse, an uncle, a cousin, or a friend.

Delinquent History
Although the girls who were surveyed were in detention at the time, 88.8% admitted having been arrested before. Of those girls, 72% were arrested in another state. See Chart 2 to see the girls’ age the first time they were arrested. When asked if they had any family members who have ever been in juvenile detention, 58.1% said yes and only about 14.6% reported a family member who was not a parent or sibling. When asked if they had a family member who had ever been in jail, 76.1% of girls who responded said yes; 55.5% of those said a parent had been in jail, 14.2% said a sibling had been in jail, and 8.3% reported other family member(s) had been in jail. When asked if they had a family member who had ever been in prison, 62.5% of the girls who responded said yes; 53.1% said a parent had been in prison, 5.8% said a sibling had been in prison, and 23.3% said other family members had been in prison. Overall, 78.9% of girls said they had a family member who had been in either jail or prison before and 56.5% of girls said their mother, father, or both parents had been in jail or prison before.

Table 1:

<table>
<thead>
<tr>
<th>Personal and Familial Suicide History</th>
<th>Yes</th>
<th>No</th>
<th>Don’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thought about harming self</td>
<td>40.4</td>
<td>59.6</td>
<td></td>
</tr>
<tr>
<td>Thought about committing suicide</td>
<td>40.6</td>
<td>59.4</td>
<td></td>
</tr>
<tr>
<td>Attempted suicide</td>
<td>25.5</td>
<td>74.5</td>
<td></td>
</tr>
<tr>
<td>Family member attempted suicide</td>
<td>24.4</td>
<td>68.6</td>
<td>6.9</td>
</tr>
<tr>
<td>Family member committed suicide</td>
<td>10.1</td>
<td>83.6</td>
<td>6.3</td>
</tr>
</tbody>
</table>

These figures are based on the valid percentages from girls who answered the questions.
The results of this study show that 34.8% of the girls had been taken from their homes, with 30.4% of the girls having been placed in foster care or in a group home. It is very possible that remaining girls who were taken from their parents but were not placed in a foster or group home simply lived with different family members. Three-quarters of the girls had run away from home, with the majority leaving their home for the first time before the age of 14. While 67.8% of girls claimed to have good and very good mental health, a little less than half (44%) of the girls had been diagnosed with a mental health disorder and about a quarter of them had thought about committing suicide. More than half of the girls reported being emotionally abused and about half had been physically abused. Less than half were sexually abused and about half of the girls reported having been sexually raped or assaulted. The majority of girls have had a parent in jail or prison. Most of the girls (88.8%) had been detained before and about half of them were arrested for the first time at or before age 13.

CONCLUSION
As predicted, the majority of the girls who were interviewed reported having experienced what previous research claimed to be delinquency predictors. This study reviewed home placements, rates of running away, mental health disorders, delinquency history, family delinquency, and history of abuse and sexual abuse. The data showed that the majority of girls had run away from home, had a parent who had been in jail or prison, and/or had been arrested before turning fourteen. Also, half or nearly half of the girls had experienced physical, emotional, and/or sexual abuse as well as half being victims or sexual assault and rape.

These results simply reviewed the factors other studies have concluded are predictors of delinquency. However, this study did not observe these factors in relation to delinquency. An in depth analysis is needed to see how factors such as mental health disorder correlate with suicide attempts (Putnins, 2005), how being a victim of abuse (Ryan, Kilmer, Cauce, Watanabe, & Hoyt, 2000; Thompson, Bender, & Kim, 2011), having mental health disorders (Welch-Brewer, Stoddard-Dare, & Mallett, 2011), having family members with a criminal history (Alltucker, Bullis, Close, & Yovanoff, 2006), and being removed from their homes (Leve & Chamberlain, 2004) affect the girls’ involvement in criminal behavior. Future studies could provide this information by asking participants more questions related to each topic and analyzing how these factors relate to the girls’ criminal activity and frequency.

REFERENCES


2012 McNAIR SCHOLAR ARTICLES
SCHOOL PROGRAM PLANNING TO INCREASE ACTIVE TRANSPORT TO SCHOOL

BY BRENDA M. AGUILAR

ABSTRACT
Studies have shown that active transport is known to increase physical activity of children, decrease traffic congestion and the production of greenhouse gases. This study examines active transport to school (ATS) [walking, biking, or other self-powered wheels to school] among elementary students. Through the Nevada Moves Day program an increase proportion of elementary students who use ATS was observed. This study was done at two elementary schools, one being the intervention school that participated in the Nevada Moves Day, and a control school, which did not participate. Data was collected over a three week period. Students using active transport and the number of motor vehicles were counted before the intervention day, the intervention day, and one week post intervention. The number of students who used ATS increased on intervention day, but the ATS rates dropped to baseline levels the next week. To increase ATS rates for the long term, interventions will likely need to be more comprehensive than a one day program promotions.

INTRODUCTION
The purpose of this study is to demonstrate that through intervention, ATS rates among young students can increase. If ATS increases, it will also decrease vehicle usage, and there would be less traffic near school zones and a decrease in fossil fuel emissions. A study done in Canada increased active transportation from 43.8% to 45.9%, and 13.3% of households reported less driving (Buliung, Faulkner, Beesely, & Kennedy, 2010). Studies have shown that kids with higher physical activity energy expenditure (PAEE) are more likely to continue to be physically active throughout their adolescent years, therefore decreasing the risk of being overweight as an adult (Singerland, Borghouts, & Hesselink, 2012). In another study that examined body mass index (BMI) levels among children in grades 4-to-6, findings showed that active commuters had significantly lower BMI values and had lower prevalence of overweight and obesity than did passive commuters (Laroushe, Lloyd, Knight, & Tremblay, 2011). Although research demonstrates that ATS is beneficial for children, rates have been declining...
since the 1960’s. Barriers to physical activity appear to be important. There are barriers that affect ATS, and in a Brazilian study, long distance was one of the most prevalent barriers followed by crime, danger and high traffic (Silva, Vasques, Martins, Williams, & Lopes, 2011). Distance from school is an important correlation of transport mode, in a Belgian study criterion distances were set at 1.5km (0.93 mi) for walking because 86.4% of children who walked to school lived within 1.5km and 3.0km (1.86 mi) and 86.5% of children who cycled lived within 3.0km from school, indicating that distance is an important predictor of ATS (D’Haese, Meester, Bourdeaudhuij, Deforche, & Cardon, 2011). Studies have also shown that ATS decreases with age. In a Swedish study, active commuting decreased from 76.4% in grade five to 50% in grade nine, but public transport increased from 18.8% in grade five to 42.6% in grade nine (Johansson, Laflamme, & Hasselberg, 2011).

Policy and school related laws on active travel also affect the decision to use ATS. Another recent study examined the relationship between legislative and regulatory laws requiring minimum bussing distances, hazardous route exemptions, sidewalks, crossing guards, speed zones, and traffic control measures around schools (Chrique et al., 2011). Findings support laws that require crossing guards near school zones as they appear to be effective at reducing barriers to walking/biking to school (Chrique et al., 2011). Also, state laws requiring special speed zones around schools increased the odds of students walking/biking to school, but it did not reduce traffic-related barriers (Chrique et al., 2011).

Knowing the benefits as well as the barriers of ATS can help identify where interventions should be implemented. In a review of Canadian studies, interventions were classified into four categories: (1) education, (2) activities and events, (3) capital improvement projects (CIP), and (4) enforcement (Buliung et al., 2012). The two that were most effective were education and activities and events (Buliung et al., 2012). Education comprised 38% of all interventions; safety education was the most common initiative, followed by workshops on school travel planning, cycling and pedestrian skills, benefits of ATS and presentations to parent councils by either facilitators or police presentations (Buliung et al., 2012). Activities and events created to raise awareness and promote ATS included international walk to school day (similar to Nevada Moves Day), winter walk day, earth day, bike clean air day, and walking school bus day. Pedometer challenge was one of the most effective, increasing ATS by 24% (Buliung et al., 2012). Other activities included the walking buddy interventions encouraging escorted or unescorted group-based walking trips and 22% of parents reported less driving with this activity (Buliung et al., 2012). The walking school bus (WSB), a similar program, has also shown to increase active commuting. Frequent walkers obtained 25% more physical activity, and gained 58% less body fat compared to passive commuters (Heelan, Abbey, Donnelly, Mayo, & Welk, 2009).

Parental involvement is crucial when it comes to any educational intervention program because parents are viewed as a major resource for administering successful ATS initiatives. They served as the walking-group leader, and handled donations or logistics (Baldwin et al., 2008). When parents are involved in the programming the children are not the only ones that benefit from the programs. Benefits include; (1) health benefits – parents are also increasing their physical activity, (2) social benefits – parents meet other parents, team members and students, and (3) community benefits – helps them feel connected by making communities a better place (Baldwin et al., 2008). Accordingly the purpose of this study was to assess the effects of a one day program on ATS and motor vehicle traffic near two elementary schools.

**METHODOLOGY**

All the data of this study was obtained through observations that occurred at two elementary schools, Estes McDoniel Elementary school (site 1) which was the intervention school and Beatty Elementary school (site 2) as the control school. Both schools started school at 8:05 am. They are seven miles apart. Estes McDoniel participated in the Nevada Moves Day on April 25, 2012. Nevada Moves Day is a promotional activity presented at this specific school to encourage parents and students to use ATS. Promotional efforts at this school included informing parents and encouraging them to have their kids participate in ATS through informational handouts, announcements, and bulletins that were sent
home. Teachers and especially the physical education teacher encouraged students to participate. At the control school, parents were notified that students were going to be observed through a three week process, but the school did not participate in the Nevada Moves Day initiative.

Observations occurred one week before the Nevada Moves Day on April 18, 2012 and after the intervention on May 2, 2012. Observations began at 7:20 am and ended at 8:05 am at both schools. Volunteers were strategically placed around the school to count students using ATS and the number of motor vehicles on selected streets adjacent to the schools. There were a total of 15 locations at both sites, six that counted motor vehicles and 9 that counted kids using ATS. When observing kids they were counted by mode of transport; walking (1), biking (2) and other wheels (3) [scooters, skate boards, etc.]. Efforts were made to count all students using ATS once, and only once, and the same for the number of motor vehicles on selected streets near the schools.

RESULTS
As seen in Table 1, ATS increased on the intervention day. Rates of ATS returned to baseline levels within one week. The data in Table 2 indicates that motor vehicle traffic was not affected by the intervention. Frequency counts were made of ATS use and autos on the three dates. Chi square was used to assess difference across the three time frames. Alpha was set at >.05 to determine statistical difference.

DISCUSSION
The research demonstrated that ATS increased significantly (X2=31.2, p<.05) from pre-intervention to the intervention week and from that date to one week post. Rates dropped significantly (X2=29.76; p<.05) from the intervention to one week post. The control school numbers remained relatively constant for all three weeks suggesting that the intervention program planning in site one was effective on the intervention day. The disappointing finding was that one week post intervention ATS rates had returned to baseline levels. The lesson appears to be that one day interventions can enhance ATS levels, but the effect is ephemeral. Future efforts should include strategies that occur over longer periods of time. Our pre-intervention data was similar to what others have found in the United States (Sirad et al.), approximately 11% of used ATS. On the intervention day rates increased to 19%. While this is a solid gain, it will likely fail to meet Healthy People 2020 guidelines (in development). We do not know the distances that children had to travel to get to school, but all students at both schools were less than two miles. It appears that will need to be done that changes the perception of walkable distances. Clearly many parents, and students believe that relatively short distances (<2 miles) are not walkable.

Table 1 Week Crosstabulation. Weekly totals of students at by site

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 1</td>
<td>131</td>
<td>172</td>
<td>126</td>
<td>429</td>
</tr>
<tr>
<td>Site 2</td>
<td>66</td>
<td>98</td>
<td>85</td>
<td>249</td>
</tr>
</tbody>
</table>

Site 1 is Estes, Site 2 is Beatty

Table 2 Week Crosstabulation. Weekly totals of vehicles by site Count

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 1</td>
<td>283</td>
<td>286</td>
<td>309</td>
<td>878</td>
</tr>
<tr>
<td>Site 2</td>
<td>385</td>
<td>377</td>
<td>382</td>
<td>1144</td>
</tr>
<tr>
<td>Total</td>
<td>668</td>
<td>663</td>
<td>691</td>
<td>2022</td>
</tr>
</tbody>
</table>

Barriers were not discussed nor studied in this research, but other studies have shown that distance, route safety, environment, and distance can be factors that determine whether or not kids will use ATS. In our study we only counted students that used ATS but no detailed research was done asking parents why their children do not use ATS.

As for the amount of vehicles observed going to school, we did not see the change that we had anticipated. The numbers were similar all three weeks and there was even a slight increase in motor vehicles used at the intervention school on the intervention day. Thus, additional and perhaps different strategies and perhaps policies will be
needed to decrease motor vehicle traffic near elementary schools.

REFERENCES


HEALTH STATUS EFFECTS ON HUMAN FEMALE MATE PREFERENCES & SOCIOSEXUAL STRATEGIES

BY TIFFANY ALEXANDRA ALVAREZ

ABSTRACT
The purpose of this study is to advance the understanding of human female sexuality and mate preferences paradigms by investigating an unexplored contextual variant (health status) we hypothesize capable of altering (1) several measures of female sociosexuality as well as (2) the appeal assigned to the secondary sexual characteristics of a prospective mate. To test this hypothesis the research design entailed (1) recruiting women when they were sick and experiencing symptoms of an upper respiratory infection (2) having those women both (A) complete a questionnaire designed to obtain, among other things, measures of her symptom severity and sociosexuality (B) evaluate the appeal of vocal and facial computer manipulated markers of masculinity and (3) having those same women complete the same measures when recovered two weeks later. Nineteen normally cycling Las Vegas women ages 18-30 provided complete measures.

Reported here are the statistically significant findings, and evolutionary explanations, of the sociosexual differences participants reported between the sick and recovered conditions. Specifically, significant contrasts existed for four measures of sociosexuality (comfort having casual sex with multiple partners, present attire proceptivity, self-assessed mate value, and reported degree of sexual desire). These preliminary findings suggest more research on the influence health status has on human female sexuality and mate preferences, is warranted.

INTRODUCTION
The variability that exists in both female mate preferences and female sociosexuality is the product of differences in the way evolutionarily stable strategies are developed. Though the same suite of evolutionary pressures (e.g. those of natural selection and sexual selection) apply to us all, their manifestation and degree of influence varies both between individuals and across time. Consequently, mating behavior and mate preference paradigms are highly sensitive and indeed responsive to change and its parameters. The evolutionary literature has interpreted the variance in female sexuality measures as facultative adjustments to changes. A recent, large, and growing body of research has shown that changes in women’s sociosexuality and differential...
preference for features indicative of masculinity occur in response to changes in hormonal profiles across the ovulatory cycle. In the several days around ovulation when females are most fertile data suggests women exhibit greater interest in mating and are more likely to prefer masculinized faces. Similarly, female sexuality appears to be contingent, in part, upon energetic factors; searching for a mate, obtaining and retaining a mate, and similarly gestation and postpartum provisioning processes (e.g. breastfeeding) are immensely energetically expensive. Consequently when energy reserves cannot satisfy present or prospective mating induced energy demands, research on female mammals has found that a trade-off resulting in muted mating efforts occurs. Although evidence of condition-dependent sociosexual variation exists, little effort has been made to identify the effect a compromised immune system and temporarily inflated energy demands might have on specifically human female sexual preferences and behavior. The theory supporting a health status induced change in strategy is well supported and warrants the prediction that sociosexual suppression during a “sick” condition is adaptive because it enables the capacity to mediate the inevitability of trade-offs in an evolutionarily stable manner.

Health Assessments and The Influence Of Dimorphism
I. Dimorphic Trade-offs
An evaluation of what is considered beautiful or aesthetic is a reflection of our species ancestral past. Assessing attraction is inextricably linked to assessing health. The traits and cues by which the health status of a prospective mate can be inferred exist in various, sexually dimorphic, characteristics of the face and can also be determined through both vocal and olfactory signals (Grammer et al 2003). To varying degrees, male faces exhibit dimorphic features: broad and pronounced chins, brow ridges, cheekbones, and large well-defined jaws. Testosterone is the hormone responsible for many of the sexually dimorphic characteristics of the body and brain (Archer 1991). Curiously, its molecular structure differs only slightly from a stress hormone which has notably been found to corroborate and at times even increase the susceptibility of an individual to disease (Flinn 1992). In both humans and animals, testosterone has been found to produce a similar immunosuppressive effect (Shanefelt et al., 2000, Robert et al 2003.) Not only is there an association between testosterone and an organism’s susceptibility to disease there is a positive relationship between immunosuppression and the expression of secondary sexual characteristics (Moller et al 1999, Verhulst et al 1999). And yet, secondary sexual characters—despite immunosuppressive costs—attract females and confer males reproductive success (Andersson 1994 Apicella et al 2007 & 2009). The immunocompetence handicap hypothesis (ICHH) suggests that such preference patterns exist because the intertwined and delicate relationship between testosterone production, the development of secondary sexual characters, and the antagonistic effect each has on immune system functioning, ensures that the degree of expressed secondary sexual characters causes a corresponding handicap that thus denotes the capacity of a biology to afford and/or mitigate the cost of induced encumbrance (Hamilton & Zuk 1982, Folstad & Karter 1992). Some of the research investigating the interaction between health and the expression of dimorphism in human male faces has found that (1) the attractive male face possesses more extreme testosterone markers than those faces deemed only average, and (2) there exists a positive relationship between the present degree of masculinity a male’s face has and his previous health (Penton-Voak 2002, Rhodes et al 2005). And yet, studies using 2D computer generated manipulations of sexually dimorphic characteristics have found that masculine faces are not unilaterally preferred (Perrett et al 1998). This variation is hypothesized to reflect differences in how women resolve the evolutionary trade-offs associated with choosing a masculine partner. Masculine faces, for example, are perceived as dishonest, unfriendly and uncooperative (Kruger 2006, Mazur & Booth 1998, Perrett et al 1998). And though the causal relationship between sexual dimorphism and these behavioral attributes remains largely unconfirmed, evidence verifying the validity of at least some of these characteristics exists. Partnered men with significantly larger amounts of circulating testosterone, for example, score lower on a spousal investment measure than their counterparts (Gray et al 2002). There exists only one facial marker of sexual dimorphism where a positive correlation with attractiveness has been
replicated several times: generally bigger lower faces (Grammer & Thornhill 1994, Muller & Mazur 1997 Thornhill & Gangestad 1999). This preference has not only been cross-culturally validated it has been cross-culturally correlated with a perceived capacity for domination (Keating, Mazur & Segall 1981). The effect of diet on health is often overlooked despite being an important contributor to immune response (De Pablo 2000). And so it is possible that the dominance behavior, as cued by such features, was especially advantageous in our ancestral environment because it conferred dominant males increased access to females by virtue of increased access to high quality nutrients and subsequent good health.

The Facultative Properties of Preference
Female sociosexual behavior and mate preference paradigms are contextually sensitive functions of a complex evolutionary calculation that, after assessing a gradient of value-altering variables, conducts an analysis of the net benefits and associated costs of pursuing a given strategy; below are some of the variables.

Life History
Demands The sociosexual strategies of females are highly sensitive, fundamentally facultative functions of change and its parameters Life history theory posits that because an individual is exposed to different evolutionary problems at different stages of life (e.g. age of juvenile development, sexual maturity, first reproduction, etc.) the selection pressures that function to coordinate an adaptive response should capture and successfully reflect those differences (Bogin et al 2007). A 2011 study of the life history effects on human female mate preferences (Koscinki) investigated the degree of attractiveness four groups of women (prepubescent, middle-aged, and both young pregnant women and non-pregnant women) assigned to 30 males faces. Overall, the preference for youthfulness, skin health, masculinity, and those faces appearing marriageable or friendly differed between the groups. Young fertile women prefer masculinity (Koscinski 2011, Little et al 2010). Older women however favor facial femininity as those qualities are depictive of “long term suitability” (Vokovic et al 2009). The preference for masculinity declines with age because age changes so too does the reproductive playing field; the preference for faces with cues of masculinity can’t enhance the reproductive success of infertile women but can for does that are fertile. Another finding in support of the idea that a facultative logic explains differences in female mate choice paradigms concerns the preference for healthy faces. The preference for these faces is best represented in pregnant women (Jones et al 2005). Pregnancy carries with it a unique hormonal profile, one characterized by surges of estrogen and progesterone. Progesterone promotes gestation by both preparing the endometrium for implantation and by moderating maternal immune response. The latter function, importantly suppresses female immunocompetence and to decrease the probability of the pregnancy being tagged as foreign and rejected (Bolin & Whelan 2009). This is an inescapable compromise that carries with it a high probability of risks for both mother and offspring. Not only is the mother more susceptible to pathogen communication, the gestating fetus is vulnerable to developmental disruption. As such, the facial cues that constitute attractivity for women in this life history stage are unsurprisingly cues of health. Others have found that progesterone stimulates the preference for feminine features in the faces of both sexes and also sets up a preference for self-resemblance (Koscinski 2011 & Debruine et al 2005). These particular preference patterns likely do not abate the risk caused by immunosuppression. Rather, the findings suggest that there is something adaptive about perceiving friendly, agreeable faces as appealing. The most adaptive scenario for this preference paradigm is that of pregnancy, as preferring familiar and friendly faces likely serves the child rearing process.

The Endocrinology of the Ovulatory Cycle: the Luteal & Follicular Phase
The four phases of the ovulatory cycle are characterized by different hormonal profiles. The hormones present during especially the luteal and follicular phase not only regulate the reproductive function of the menstrual cycle they affect female sociosexuality and mate preferences (Penton-Voak et al 1999, Fessler et al 2005, Gangestad et al 2007, Haselton 2006). The third phase of ovulation, the luteal phase, undergoes acute exposure to higher than average levels of progesterone. The adaptive purposes of high progesterone levels during pregnancy are, as mentioned before, two-fold. In the case of ovulation only progesterone’s first
function is adaptive; its second function—immunosuppression—is likely a byproduct. Accordingly, women in the luteal phase of ovulation employ the use of compensatory behavioral mechanisms to mitigate the increase risk of disease. They not only exercised more precaution when exposed to pathogens, they engaged in preemptive, otherwise unusual, cleaning behavior (Fleischman & Fessler 2010). And much like pregnant women, they experience elevated disgust sensitivities to foods that contain a higher than average pathogen risks (Fessler et al 2005). Progesterone induced prophylactic precautions are so well-rounded they affect the mate choice sphere as well. Puts (2006) reported that elevated levels of progesterone are positively correlated with a preference for vocal femininity. Moreover, a study manipulating the expression of 2D facial features that honestly signal health (e.g. face shape, texture and color) found that the faces that were most preferred by women in the luteal phase, and women using oral contraceptives (contraceptives contain synthetic versions of progesterone), were not those with little sexual dimorphism (feminized faces) but rather those with the cues that signaled apparent health (Jones et al 2005). These results of this study complicate Put’s (2006) findings because the study also found that facial stimuli evaluated as healthy inextricably contained cues of masculinity. Faces manipulated to increase apparent health were evaluated as more masculine than faces transformed to decreased apparent health “our findings for stimuli calibration suggest enhanced attraction to apparent health […] overrides strong preferences for feminine male faces when progesterone levels are raised” (Jones et al 2005). Curiously, however, the interchangeability of the relationship was not bidirectional—health stimuli signaled masculinity and health but masculinity stimuli signaled only masculinity. And yet, evidence warranting the relationship between the preference for masculinity and an aversion to pathogens exists. In both manipulated and un-manipulated 2D faces the degree by which a woman was disgusted by pathogens predicted the strength of her preference for facial masculinity (DeBruine et al 2010, Little et al 2011).

It is during the late follicular phase that the female body prepares an egg for fertilization (ovulation); as such, it is during this time window that the fitness benefits copulation has to offer are at their highest for both sexes. Despite our species’ lack of visual cues indicative of ovulation (e.g. the obvious genital swellings of female chimpanzees) research suggests human female mating behavior and psychology are sensitive to ovulatory shifts and the subsequent changes in fertility they induce. Good Gene theorists have hypothesized that the shift towards fertility produces a preference paradigm favoring phenotypic qualities indicative of heritable benefits (Gangestad et al 2007). And for the most part, research has found that ovulating women exhibit a preference for (a) phenotypic cues indicative of biological quality (b) auditory cues of masculinity and (c) a weaker preference for traits indicative of friendliness (Kosciniski 2011, Puts 2005, Gangestad et al 2004). The follicular phase also alters mating behavior and psychology. When women ovulate they experience elevated levels of sexual desire, fantasize more, and become more intra-sexually competitive (Bullivvant et al 2004, Fisher 2004). Similarly, it is during this time that men find women more attractive, their scent most appealing and are consequently both more loving towards them and more easily made jealous (Singh & Bronstad 2001, Haselton & Gangestad 2006). Durante (2008) sought to quantify and compare, an element of sociosexuality; proceptive behavior—actions taken by to enhance the appetitive response of a member of the opposite sex—in women with across the ovulatory cycle. Participating women illustrated on graphed paper an outfit they would wear to "a social gathering where single attractive peers were likely to be present and opposite sex socializing would take place." Researchers found that the outfit illustrations of women in the follicular phase revealed more skin than those of their less proceptive luteal phase counterparts. It is likely that female attractivity, as evaluated by males, is closely tied to the proceptive attitudes of females. The proximate mechanisms stimulating the manifestations of proceptivity are likely many and multidimensional. Testosterone peaks right before ovulation and might be one such factor; ovariectomized rhesus monkeys increase proceptive behavior in response to systematic testosterone injections (Beach 1979). Similarly, (A) women taking modest doses of testosterone report an increased libido and wear more attractive clothing than women in control conditions and (B) women with consistently higher measures of
salivary testosterone, but not estrogen or progesterone, prefer masculinity in both male and female faces (Dabbs et al. 2003, Welling et al. 2007). The preference shift towards masculinity cannot be explained by a woman’s changed fertility status alone. The change in fertility status produces a series of interrelated and mutually enforcing effects; a bidirectional attractiveness effect—with men most attracted to women and women most attracted to men—produces positive feedback and causes an inclination toward proceptive behavior; this stimulates female confidence, affords a temporary broadening of mate preference paradigms, and consequently produces a preference for dimorphism. Ovulation triggers a facultative preference pattern that takes advantage of temporarily suppressed parameters that if present would otherwise constrain the mate choice criteria females with varying degrees of stimulus value could reasonably apply.

**Condition Dependent Choices and Changes: Mate Value & Sociosexuality**

The tragedy of unrequited love is understandably maladaptive; falling for an uninterested super-mate wastes time, energy, and resources. Consequently, mate preferences have evolved a two-dimensional condition-dependent nature that combines and applies to the condition of the self and a prospective mate. In this regard, the facultative reach of mate preferences is evidenced by the fact that the average person partners with someone of similar attraction, intelligence, and status as themselves; disparities are far and few (Symons 1979). Being a mate of good condition—of high mate value—affords choosiness. It affords a mating preference paradigm that uncompromisingly prefers the characteristics that make a person evolutionary fit (e.g. health, provisioning capacity, etc.). Research has shown that women with high self-assessed mate values are more likely than their counterparts to prefer masculine and symmetrical male faces (Little et al. 2001). The preference for markers of phenotypic and genotypic quality is likely supported by the female’s own quality. The high mate value mitigates the risk and costs of low paternal investment and/or desertion as (A) high quality men gain more from investing in high quality women and the high quality offspring they might produce than they would were they to invest in a mate of low value and (B) given the unlikely case of desertion, the female, because of her high quality, could likely find a replacement (Penton-Voak, Little, Burt, Tiddeman & Perrett 2003). Comparative evidence also warrants the moderating influence of self-condition on mate preferences. For example, the color intensity of male three-spined sticklebacks is compromised by parasites; as such, bigger females in presumably better condition and of higher mate value preferentially mate with the most vibrantly colored males, while females in poor physical condition actually prefer the males that are more dimly colored (Bakker Kunzler & Mazzi 1999).

The influence self-assessed mate value has on human mate choice criteria can also be moderated by the temporal context of the relationship. A study using two measures of their participant’s mate value, waist-to-hip ratio, and facial attractiveness as determined by third party male members, asked participants to “alter the [2D male] face until it [was] closest to the appearance they found most attractive for a short or long term relationship” (Penton-Voak et al. 2003). The researchers found that the temporal context of the relationship only affected the mate preferences of women with low mate value. Specifically, low condition females preferred faces with feminine features for long term relationships, and faces with masculine features in the short term. Apart from the difference in time-frame, short term relationships have a much more uncommitted and fluid nature. Examples range from casual one-time spur-of-the-moment dates, to one night stands. The willingness to engage in casual sex is a characteristic of an open sociosexuality and studies have found that the sociosexuality of a woman helps predict her preference for masculinity (Simpson & Gangestad 1992). Women averse to uncommitted sex value male attraction less than their open counterparts (Waynforth et al. 2005). These mating strategies and their respective preference patterns are moderated by a female’s own mate value and are all about returns; women with permissive sexualities gain the most if they have short term relationships with men of good quality and long term relationships with good provisioners.

**The Mutually Inclusive Effects of the Variables: Partnership Status**

Much like the preference for masculinity occurs in interaction with the above reviewed variables (e.g. ovulation, sociosexuality, life history demands) the
preference also interacts with a female's current relationship status. In the real world a 23 year old woman that is both ovulating, of high mate value, and in a happy committed relationship, exists. In her case, these variants have a mutually inclusive, bidirectional effect. Consider this, women with high estimated levels of estrogen are on average more happy in, and more committed to, their relationships (Jones et al 2005). Relationship contentment, in this case, could arguably be affected by female mate value; as it is likely that the consistency of slightly elevated estrogen levels is a proxy and a cue encouraging male investment (Haselton & Gangestad 2006). Elevated progesterone levels, furthermore, affect relationship commitment; specifically, women in the luteal phase of display increased commitment to their long-term partners (Jones et al 2005). Moreover, ovulating women happy in a committed relationship increase proceptive attitudes; in Durante’s (2008) study, the partnered and satisfied women produced outfit illustrations that showed more skin than those of their unsatisfied counterparts. These women may be prompted to show more skin—thereby increasing their attractiveness—to compete with women who may threaten the current status of her relationship. Being partnered, while also experiencing follicular proceptivity, has been found to influence the preference for sexual dimorphism in extra-marital/extra-pair relationships. Women in long term relationships are particularly appealed by the prospect of having a short-term relationship with specifically a very sexually dimorphic man. The opposite is true when the woman has to judge men in terms of a long-term relationship—she, in that case, prefers the more feminized face (Little et al 2002).

Population-Level Parameters: Socioeconomic Status & Contextual Health
The socioeconomic status (SES) of individual is primarily determined by two co-dependent variables: level of education and financial accessibility as determined by income. There exists a two-way interaction between health and economic status; there is, for example, a positive relationship between low SES and poor health (Smith 1998). The most recent data available for the United States, moreover, indicates that socioeconomic health disparities produce, and are sustained by, unequal access to health insurance and/or preventative health care services (American Psychological Association 2012). Heterogeneity, in terms of socioeconomic status, exists at both a regional and population level. Swami and Tovee (2005) investigated the preferences of British and Malaysian women that varied in socioeconomic status. Whereas the UK sample included only women of high SES, the Malaysia sample contained both. In Malaysia and the UK, women of high SES placed more value on a waist-to-chest ratio showcasing a broad upper body than they did on overall body mass index; the primary component of bodily attraction for the low SES group was overall body weight (Swami & Tovee 2005). Given the relationship between (A) health and SES and (B) body fat and wealth (in rural communities), these findings are likely indicative of a mate choice paradigm that prioritizes economic success and provisioning ability because it is likely that these capacities (more so than those supplied by the alternative) will confer the female better fitness and higher reproductive success (McGarvey 1991).

The causal power of contextual variability is evidenced by the effect the health of a nation has on human female male preferences. Debruine et al (2010) investigated the appeal females from 30 countries assigned to facial masculinity. The countries were indexed and assigned scores based on WHO markers of health (e.g. life expectancy, impact of communicable disease, etc.). The selection pressure favoring masculinity was strongest in countries with a low national health index (NHI). The relationship between contextual health and the preference for sexual dimorphism, was so strong, it proved to be “a better predictor of average masculinity preference than cross cultural variation in [sociosexuality]” (Debruine et al 2010). A similar study comparing Jamaican and UK populations found that the preference for masculinity was strongest in environments where poor health was more prevalent and/or carried higher costs (Penton-Voak et al 2004). Similar findings have been replicated in laboratory settings; women primed with a threat of pathogen contagion experienced an increased preference for symmetry and masculinity but curiously only for faces of the opposite sex (Little, Jones, Debruine 2011). Even after controlling for potential confounds, data of 29 cultures furthermore suggests that women
living in conditions with an increased risk of pathogen contagion evaluate expressions of vocal and facial masculinity as more appealing than the alternative (Gangestad & Buss 1993, Apicella et al 2007). It has even been suggested that pathogen stress shares a linear relationship with polygyny; as areas with increased pathogen prevalence have more polygynous marriages (Low 1990). If such a relationship is causal, it would indicate that in environments with an increased probability of contagion female mate choice paradigms trade paternal provisioning for heritable health benefits.

Immunocompetence Effects on Mate Choice & Sexuality
Coordinating & Executing the Immune System Response
Immune system quality is a base variable that affects mate choice paradigms, but why? Immune system quality matters for the same reason sexual reproduction exists; it confers a species the ability to react to an environment with rapidly evolving, often deadly threats: pathogens (Ridley 1993). The fact that immune system quality is determined by a large cluster of genes located on the most polymorphic region of the human genome illustrates that the capacity of sexual selection to produce increasingly adapted organisms is well refined (Milinksi 2006, Roberts & Roiser 2010). The process by which the immune system responds to an invasion is similarly well-adapted and elegant. The immune system produces three types of responses: the constitutive, the adaptive, and the acute. The first, mediates the functions of the innate components of the system (e.g. macrophages and white blood cells), the second stimulates the production of antibodies that help tag and fight the pathogen (B and T cells), and the third (a) heightens the functioning of all leucocytes, (b) stimulates the release of helpful proteins and (c) helps the body regain homeostasis through allostatic sickness symptoms that often affect behavior (Adelman & Martin 2009). Research from psychoneuroimmunology (PNI) suggests that successfully coordinating and executing the many layers of the immune response—especially given its high metabolic costs—prerequisites interaction with endocrine and nervous processes. Molecules at the interface of the interaction, cytokines, engage in bidirectional communication with all three systems to disclose relevant contextual information (e.g., infection status, energetic reserves, nutrient levels, breeding state) that affects immune functioning and the expression of sickness behaviors (Adelman & Martin 2009). Though seemingly maladaptive, sickness behaviors such as anorexia and lethargy indirectly help fight infection (the loss of appetite experienced during disease starves pathogens of needed nutrients) and/or mitigate the metabolic costs of the immune system response (Adelman & Martin 2009).

The Conditional Expression of Sickness Behaviors: Effects of Disease on Mating Effort & Sexuality
Immune response costs compete, react to, and trade-off with reproductive interest and mating effort. Energy budgets, though fixed, are not necessarily static. In the presence of disease, energy budgets seem to adapt to investment demands by cataloging their importance and producing an appropriate trade-off. Illness, via the immune system response, has the capacity to activate emergency life history stages aimed at mitigating the negative feedback of change by ironically evoking more change to restore homeostasis. One of the key features distinguishing the emergency response from similar but shorter lived phenomena (e.g. the fight-or-flight response) is that it systematically halts and replaces what may be considered “normal” or even “evolutionarily motivated” behaviors with actions that seemingly fail to enhance fitness prospects (Wingfield et al 1998). When sickness becomes so severe it may threaten survival, mating effort is muted and immune system investments increase. Hondurian males infected with a malarial pathogen have significantly lower testosterone levels than same-age controls; similar findings have been replicated with rats (Muehlenbein 2010, Wingfield et al 1998). Alternatively, when contextual variants inflate the value of the fitness benefits conferred by sexual reproduction, immune induced trade-offs can be managed in a manner that allows for a reallocation of energy to mating effort. During their breeding season, male sparrows treated with LPS—a nonpathogenic antigen that simulates the early stages of infection—demonstrated no significant decrease in a sexually dimorphic behavior instrumental to the intra-sexual competition of the species, when the mating season ended however, LPS treated males decreased the behavior (Owen-Ashley & Wingfield 2006). Metabolic hormones (e.g., glucocorticosteroids, corticosterone) seem to play an important role in the mating suppression
process. Owen-Ashley & Wingfield (2006), for example, also found that LPS treated sparrows experienced an increase in corticosterone which went on to counteract the effect of testosterone. The evolutionary significance of inhibiting the hormone that’s responsible for the activation of sexual desire revolves around setting up a future in which the conditions for reproduction are optimal, and its benefits consequently maximized. Evidence suggests moreover that in the presence of disease the manner by which trade-offs are resolved also varies by sex. When male and female rats are treated with LPS, only females reduce mating behaviors (Aubert et al 1997). Females of most all mammalian species are the ‘chooser’ of the sexes because the obligatory, often dangerous, and always energetically expensive postpartum care and internal gestation they provide inherently inflate the cost of reproduction (Geary 2000). The pregnancy stage alone is so expensive it, if given the opportunity, has the capacity to trade-off with subsequent pregnancies. Human females, in an effort to mediate such an effect, limit investments in nutrient flow to developing fetuses much less with later-borns than with first-borns (Gluckman et al 2009). Thus, it seems likely that the energetic budgets of sick females—especially those with high offspring investments—should prioritize personal health over copulation opportunities, as both present and future fitness benefits associated with copulation, risk being undermined if not completely eliminated, if conception occurs during illness. Such a scenario has been shown to jeopardize maternal health, offspring quality and, in relevant species, offspring quantity (Avitsur & Yirmiya 1999 & Muehlenbein 2010). Individual level differences, lastly, also appear to affect the impact disease has on mating effort and sexuality. The adaptive significance of emergency life history stages is shared by immune-evoked behavioral sickness symptoms. Symptoms capable of suppressing mating propensities and behaviors (e.g. decreased libido) exclusively develop in females capable of increasing fitness by postponing reproduction; females with low residual mate value (RRV) do not meet the criteria and as such experience the symptom at a much lower frequency (Adelman & Martin 2009).

**SUMMARY OF LITERATURE REVIEW**

Despite being unified by the same suite of evolutionary goals there exists variation in the degree and type of evolutionary pressures organisms are exposed to and must function within. The context dependent nature of human female reproductive strategies is the result of such variability. Female sociosexual behavior and female mate preferences are facultative fluid functions of an evolutionary agenda designed to produce an optimal response in a vast range of temporal and spatial contexts. The body of literature this paper reviews suggests female reproductive strategies adapt to changes in life history demands, partnership status, socioeconomic parameters, reproductive phase and function, self-assessed attractivity, pathogen contagion probability, and immune induced energetic trade-offs. The purpose of this research concerns the latter point; although immune factors have been found to trade-off with reproductive and sociosexual investments in female mammals the relationship between human women’s health status and mating strategies remains unconfirmed.

**METHODOLOGY**

The effect of health status on human female sociosexuality and mate preferences was tested in 19 female participants. All 19 participants were normally cycling heterosexual adults (age 18-30) experiencing the symptoms of an upper respiratory infection (e.g. cold, influenza, bronchitis, sinusitis, whooping cough, pneumonia, etc.) and neither pregnant, with an STD, Urinary Tract Infection, or Acute Pelvic Inflammation. Exclusionary criteria purposefully narrowed our sample demographic by filtering out women who (a) presumably had higher than average sociosexualities (b) were hormonally distinct from regularly cycling women and (b) were experiencing chronic infections/viral stress. Participants were asked to complete a six page questionnaire designed to assess sociodemographic data, sociosexuality measures (e.g. proceptivity, attractivity, receptivity), relationship status, symptom severity, and current, if any, hormonally altering method of contraception and/or medication. Using superlab software, participants then listened (with headphones) to 12 different pre-recorded and randomized male voices varying in frequency (see Puts et al 2007 for a review of the methods); they evaluated their attraction on a 1-5 scale. Afterwards, again using superlab software, participants were presented with a total of 5 randomized sets of three male photographs
(varying only in expressed dimorphism); the triad face-sets were in full color and the product of computer morphing techniques. (see Penton-Voak 2002 for stimuli). Each set varied in ethnicity but the 2D facial triads that were presented were always ethnically grouped; during a set, three faces of white men, for example—masculinized face to the left, feminized to the right and average in the middle—were presented. Participants were asked to rate the photos within the face-sets in terms of five different traits (health, “niceness”, “meanness”, and long-term/short-term attractiveness), trials were not timed. For the follow-up condition, subjects had the option of completing the same measures, two-weeks later, via an online portal.

The study had some limitations. One, the sample size was small and of predominantly one demographic (e.g. 24 year old college students). Two, though 2D face stimuli provide an objective and systematic way to manipulate masculinity, evidence suggests that because computer generated faces are consistently rated as more attractive, they are not prototypical at all. Three, self-report data are not very reliable; self-rated attractiveness and other-rated attractiveness are two methods that produce two different scores. Moreover, because the nature of questions designed to obtain a measure of sociosexuality is inherently sensitive, the data collected may reflect inflated results. Four, when women were asked "In the last 48 hours how often did you reach orgasm?" the answers from which they chose were not intuitively scaled (0= no sexual activity, 1= almost always, 5= almost never or never). The data from those questions was not included in our analyses.

DATA: ANALYSIS RESULTS & INTERPRETATIONS

At the heart of the context specific nature of female sexuality lays one core principle; compulsory energetic investments (like those of immune system response as motivated by self-maintenance) cause tradeoffs that change behavior and psychology (e.g. sociosexuality and mate preferences). Thus, our hypothesis: measures of female sociosexuality will significantly contrast within females and between conditions because they are moderated by health status differences. Though stimuli data was not analyzed, significant results for four measures of female sociosexuality were nevertheless found. A two factor repeated measures ANOVA (pictured right) revealed that the difference between participants reported degree of sexual desire during the sick condition was significantly lower than that reported in the recovered condition (p ≤ .000).

Moreover, both a bivariate correlation and nonparametric comparison of reported sexual desire and symptom severity during condition one found that as symptom severity increased sexual desire respectively diminished; sick women allocate so much energy to immune function it trades off with reproductive investments. The emergency life history response induced by sickness, because it is coordinated by a selection pressure that places evolutionary goals secondary to survival, is capable of involving the interruption of many and any competing demand. But—given that there is a contextual dependency for any given strategy—might desire or another measure of sociosexuality be furthermore moderated by variables that have the capacity to affect female residual reproductive value? We hypothesized that high mate value individuals as well as those in a relationship would benefit least from reproduction during the sick condition because they have higher RRV than their single, low mate value, counterparts. We used a general linear model to test the differences in desire between subjects, with relationship status and high mate value as covariates, and no significant differences were found. However, given the limitations of the study's design (e.g. its small sample size and use of self-report data) the possibility of the relationship existing has not been discounted. Lastly three other measures of sociosexuality, when ran independently, exhibited statistically significant contrasts. Women in the recovered condition report (A) a higher level of hypothetical comfort to have casual sex with multiple partners, (B) increased feelings of sexiness and overall body and facial attractivity, and (C) when asked to evaluate how attractive men would perceive her present attire, females' answers reflect an increased state of self-assessed attractivity.

Such findings, though preliminary, warrant future research. Such research should identify the proximate mechanisms responsible for the condition contrasts. Moreover, research on the effect health status might have on human female mate preferences should target the effect facial features like symmetry and cues of ‘good health'...
might have on attraction assessments. Lastly, it would be interesting to see if a facultative preference for a type of immunohistocompatibility marker varies across health status conditions.

Table 1:

<table>
<thead>
<tr>
<th>Summary of Case Characteristics</th>
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<tbody>
<tr>
<td>N, Minimum, Maximum, Mean, Variance</td>
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<tr>
<td>Age</td>
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<tr>
<td>Symptom Severity</td>
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<tr>
<td>Number of Women in a Relationship</td>
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<tr>
<td>Attire Attractivity (Sick)</td>
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<tr>
<td>Attire Attractivity (Recovered)</td>
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<tr>
<td>Desire (Sick)</td>
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<tr>
<td>Desire (Recovered)</td>
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<tr>
<td>Casual Sex Comfortability (Sick)</td>
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<tr>
<td>Casual Sex Comfortability (Recovered)</td>
</tr>
<tr>
<td>Participant Total</td>
</tr>
</tbody>
</table>

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EVALUATING THE CONVERGENT VALIDITY OF THE MEASURE OF EMOTIONAL CONNOTATIONS

BY DANIEL N. EROSA

ABSTRACT
The Measure of Emotional Connotations (MEC; Barchard, Kirsch, Anderson, Grob, & Anderson, 2012) is a new test that has been developed to measure the ability to perceive the emotional connotations of written language. To examine its convergent validity, the MEC will be correlated with the two emotion perception tasks on the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT; Mayer, Salovey, Caruso, & Sitarenious, 2003). These MSCEIT tasks are valid tests of emotion perception; thus, strong correlations would provide support for the MEC as a valid test of emotion perception.

INTRODUCTION
Emotion perception is the ability to identify and interpret emotional stimuli, which alters an individual’s emotional state in response to the stimuli (Phillips, Drevets, Rauch, & Lane, 2003). There are two types of tests that examine emotion perception: non-verbal and verbal. Tests using non-verbal stimuli, such as the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT) (Mayer, Salovey, Caruso, & Sitarenious, 2003) or the Diagnostic Analysis of Nonverbal Accuracy (Nowicki & Duke, 1994), use a variety of stimuli to measure emotion perception. The Diagnostic Analysis of Nonverbal Accuracy uses four tests to measure how respondents perceive emotions (facial expressions, gestures, posture, and tone of voice) and express emotions (facial expressions, gestures, and tone of voice). On the MSCEIT, participants rate how much or how little a picture or face is expressing a specific emotion on a five-point scale, where 1 signifies not at all and 5 signifies extreme. These tests have been proven as valid tests for emotion perception (Mayer, Salovey, Caruso, & Sitarenious, 2003, Nowicki & Duke, 1994).

Verbal tests, such as the Metaphors Test and Gregory’s Test (Gregory & Waggoner, 1996), ask respondents to identify the emotions conveyed in written language. Both of these tests use metaphors as their stimuli. Metaphors are appropriate stimuli for a test of emotion perception due to the fact that they are used to convey meaning without explicitly stating it directly. Metaphors require the individuals interpreting the
metaphor to go beyond the literal meaning and examine its connotations (Lakeoff, 1995). Although the Metaphors Test and Gregory’s Test ask respondents to identify the emotions associated with written language, they do not provide a pure measure of the ability to perceive the emotional connotations of written language, because they also require the ability to understand metaphors.

The MEC was developed in order to measure the ability to perceive the emotional connotations of written language. The MEC contains five different item types. The test stimuli contain no metaphors and no explicit emotion words, and thus MEC provides an uncontaminated measure of the ability to perceive the emotional connotations of written language. The MEC is unique in that it allows both veridical scoring and proportion consensus scoring. The MEC could greatly influence the way individuals are hired for employment. For example: Managers write to employees, online customer service representatives write to customers, and online counselors write to clients. Using a test, such as the MEC, may be helpful because it would allow for the selection of staff that is skilled at perceiving the emotional connotations within language. This would be important for companies to select the most qualified individuals for the positions.

LITERATURE REVIEW
Emotion perception is the ability to identify and interpret emotional stimuli, which alters an individual’s emotional state in response to the stimuli (Phillips, Drevets, Rauch & Lane, 2003). There are two types of tests that examine emotion perception: non-verbal and verbal.

Non-Verbal Tests of Emotion Perception
Most tests of emotion perception use non-verbal stimuli. Tests of non-verbal stimuli use stimuli such as pictures, videos, and audio clips in order to measure how emotionally perceptive a person is by trying to interpret the emotion expressed through that stimuli.

MSCEIT
The MSCEIT (Mayer et al., 2003) is designed to measure four branches of emotional intelligence. One of those branches is Emotion Perception. This branch is measured with two tasks: Faces and Pictures. In the Faces Task, participants are asked to look at a face, then are asked to rate the face on a five point scale, based on four different emotion questions. The Pictures Task is similar to the face’s task, but instead of faces, landscapes and abstract photos are used (Mayer, Salovey, Caruso, & Sitarenious, 2005).

The MSCEIT is scored using proportion consensus scoring. In proportion consensus scoring, scores are given based on the number of participants who chose each response option. For example, if 3 participants out of 10 believed a certain response choice was correct, the score would be .3.

Diagnostic Analysis of Nonverbal Accuracy
The Diagnostic Analysis of Nonverbal Accuracy (Nowicki & Duke, 1994) measures the ability to perceive and express happiness, sadness, anger and fear. Diagnostic Analysis of Nonverbal Accuracy contains four tests of how well individuals perceive emotions (facial expressions, posture, gestures, and tones of voice) and three tests of how well individuals express emotions (facial expression, gestures, and tone of voice). The emotions were chosen because they are frequently encountered in everyday life by age 10 (Nowicki & Duke, 1994).

Verbal Tests of Emotion Perception
The ability to perceive emotions in non-verbal stimuli is essential, but so too is the ability to perceive emotions in verbal stimuli. In the modern world, we frequently need to determine the emotions of people through their writing (e.g., emails, memos, and blogs). Unfortunately, only a few test of emotion perception use verbal materials. Two of these tests use stories, and two use metaphors.

Emotional Accuracy Research Scale
The Emotional Accuracy Research Scale (Mayer & Geher, 1996) was created as a way to attempt to measure how perceptive an individual is to another individual’s emotion. The Emotional Accuracy Research Scale uses thought samples (descriptions of specific situations) from eight individuals. These individuals also rated their feelings on a number of items. For each thought sample, the test designers selected 12 items that the individual said described how they felt, and
12 items that did not describe how they felt, and arranged them into 12 dichotomous pairs. Test takers read the thought sample, and from each pair they chose the response that indicates how the individual felt.

The Emotional Accuracy Research Scale allows researchers to calculate both target and consensus scores (Mayer & Geher, 1996). Target scores compare the participants' answers with the answers given by the creator of thought sample. Consensus scores agreement is the same as proportion consensus scoring. (Mayer & Geher, 1996).

Multifactor Emotional Intelligence Scale
The Multifactor Emotional Intelligence Scale (Mayer, Caruso & Salovey, 1999) was a precursor to the MSCEIT. One of its tasks is the Stories Task. The Stories Task includes six stories that were created by having fifteen people report on situations or thoughts affecting their mood. Respondents were then asked to record their moods on a 30-item mood-adjective checklist use a five point scale (Mayer, Caruso & Salovey, 1999).

Gregory's Test
Gregory developed a test of the ability to recognize happiness, sorrow, fear, and anger in metaphors. Participants read 12 short (metaphors) sentences, selected one of two emotions that described the sentence, and then explained why they selected that emotion. Gregory's test was scored based upon the response to these same metaphors, when they were used in Waggoner and Palermo (1989). Thus, there was no theoretical reason to specify that these were the correct answers: The scoring key was based upon the consensus of previous participants. This is equivalent to a form of consensus scoring called "Mode Consensus Scoring" (Barchard & Russell, 2006) in which the correct answer to a test item is the most commonly selected answer.

Metaphors Test
The Metaphors Test (Barchard, Anderson, Hensley & Walker, 2011) was designed to measure the ability to perceive the emotional connotations of written language. Respondents are presented with a metaphor followed by three emotion words. For example, the metaphor might be: "His face is a ray of sunshine", and the items stems might be "uplifted" or "embarrassed". The participants are then asked, "To what extent does the metaphor convey each of the emotions given?" They respond using a five point scale (1 = not at all, 5 = extreme). The test is scored using proportion consensus scoring.

Measure of Emotional Connotations (MEC)
All tests of the ability to perceive emotions in verbal materials use some form of consensus scoring. Mode consensus scoring is biased against smaller groups (Barchard & Russell, 2006). Proportion consensus scoring fails to identify the correct answers to a test when the items are difficult (Barchard, Anderson, & Hensley, 2012). Thus, it would be beneficial to create a test of the ability to perceive emotions in verbal material without using consensus scoring. MEC (Barchard et al., 2012) items are being created based on empirical research. For example, Koveceses (1986) and Lakoff and Johnson (1980) used a lexical method to identify commonly used ways of describing emotions. They found that people often describe happiness as being "up"; "I feel up today" and "She is in high spirits." Therefore, verbal materials that use the concept of up should convey happiness. Test stimuli were therefore constructed to include words associated with up: for example, fly, rise, up, and soar. Similarly, situations in which something is described as down can be seen as sad. MEC contains five types of verbal stimuli. See Table 1. The first three item types are similar to the items from Gregory and Waggoner (2008).

The last item type is similar to the items on the Multifactor Emotional Intelligence Scale and the Emotional Accuracy Research Scale. The MEC stories are different in three ways. First, the verbal stimuli are based upon previous research on conceptual metaphors for the four emotions. Second, the MEC does not use explicit emotion words, such as happy or joyful in the stimuli themselves, the way the other two tests do. Finally, the MEC includes four stories for each scenario: The content is the same, the only difference is the phrasing of the ideas in order to convey the different emotions.

All MEC items will be administered with two different response methods: forced choice and rating scales. The forced choice response scale will
ask participants to choose the emotion that best fits the item. For example, if a participant was presented with the two-word phrase “steaming kettle”, the participant would have to choose whether “steaming kettle” expressed happiness, sadness, anger, or fear. The second type of response scale for the MEC is the rating scale. Rating scales allow the participants to rate the extent to which an emotion is expressed by the verbal stimuli. For example, a participant may decide that anger is present in the stimuli “steaming kettle”, so it would give it a rating of five (extreme) and other emotions, such as happy, might receive a rating of one (not at all).

### SUMMARY OF LITERATURE REVIEW
Several tests of emotion perception already exist. Most use non-verbal stimuli. Only a few use verbal stimuli. The tests that use verbal stimuli are all scored with some type of consensus scoring. Measure of Emotional Connotations (MEC; Barchard et al., 2012) has been designed to be scored both with consensus scoring and with veridical scoring. The veridical scoring key is based upon empirical research on the conceptual associations for happiness, sadness, anger, and fear. This study will examine the convergent validity of MEC, by correlating it with the emotion perception tasks from the MSCEIT.

### METHODOLOGY
#### Participants
A total of 800 undergraduates from the UNLV subject pool (200 in each group) will participate in this study for 3 credits towards their psychology course. The study will take approximately 3 hours (45 minutes for MSCEIT and 2 hour and 15 for the MEC). Previous research from this subject pool has shown that most participants are between 18 and 22, with slightly more women than men.

#### Measures
Demographics Questionnaire
Participants will answer a series of demographic questions. These include sex, age, ethnicity, first language, how long they have spoken English, and, between 1 and 10, how comfortable they are reading and writing English, where 1 is "very uncomfortable, it's a real struggle" and 10 is "perfectly comfortable".

**MSCEIT**
The Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT; Mayer et al., 2003) is a test of emotional intelligence. For the purposes of this study, only the emotion perception tasks will be used. The emotion perception tasks use non-verbal stimuli, specifically pictures of faces, landscapes, and abstract photos. Individuals are given a picture and use a five-point scale to indicate the extent to which an emotion is being expressed by the face, landscape, or abstract photo. The MSCEIT is scored using proportion consensus scoring.

**MEC**
As described above and in Table 1, Measure of Emotional Connotations (MEC, Barchard et al., 2012) contains five item types, which are given with two types of response options. Two hundred participants will use the forced choice format for all MEC items. They will be randomly assigned to one of three groups: “two word phrases,” “imagine yourself as,” or “a person feels like they are.” Within that group, the participants will receive all 30 phrases per emotion (anger, fear, sadness, and happiness); thus the first part will total 120 items.
The next task for these participants is the Sentences task. Each participant will be assigned 10 sentences for each emotion, totaling 40 items. Finally, participants will complete the Stories task. The participants will be randomly assigned one of the four paragraphs (anger, happiness, sadness, or fear) for each of the scenarios (such as “The plane is leaving” and “I am going shopping today”), totaling to 5 items.

The other 600 participants will use rating scales for all MEC items. They will be randomly assigned to one of three groups: “two word phrases,” “imagine yourself as,” or “a person feels like they are.” Within that group, participants will only be assigned 10 of the 30 possible items. Thus, they will complete 40 items, and will rate each on the four rating scales (for happiness, sadness, anger, and fear), for a total of 160 items. Next, participants will rate the 40 sentences (10 for each emotion). For each, they will complete the four rating scales, for a total of 160 items. Finally, participants will complete the Stories task. As was the case for the first group, participants will be randomly assigned one of the four paragraphs for each of the scenarios (such as “The plane is leaving” and “I am going shopping today”). However, these participants will rate each story for each of the four emotions, for a total of 20 items.

MEC items will be scored using two methods. First, all MEC items will be scored using proportion consensus scoring. Proportion consensus scoring involves allotting a value to the response based on the number of participants who felt it was the correct choice. For example, if seven out of ten participants believed that “steaming kettle” was angry, it would receive a score of .7. For rating scales, the proportion consensus scores will be summed across the four emotions for each stimuli, so that there is a single score for “steaming kettle.”

Second, all MEC items will be scored using veridical scoring. The precise details of the veridical scoring method depend upon whether the item is forced-choice or rating scale. First consider the forced choice items. For example, “erupting volcano” was designed to express anger. So, the keyed response is anger. If the respondent selects anger, they will receive a score of 1. Otherwise, they will receive a score of 0. Now consider the ratings scales. For the keyed emotion, the score is equal to the response of the participant. For example, if a participant put 4 for angry, they would get a score of 4. For non-keyed emotions, the score is equal to 6 minus the response. For example, if the participant put 1 for sad, they would get a score of 5, and if they put 2 for happy, they would get a score of 4.

PROCEDURES
Participants will be recruited though the UNLV Psychology Subject Pool. The study will be advertised using Sona Systems, which will direct interested students to the online materials for the study. Participants will first complete the demographics questionnaire and MEC. Then they will be directed to the MSCEIT website. The participants will be sent a debriefing email as soon as they begin the study so that they will receive the debriefing regardless of whether they complete all parts of the study.

The materials for this study are being created using Qualtrics. Qualtrics is a type of computer software that has been created for researchers to use when conducting their research. It allows researchers to design online study materials and to administer these materials to participants.

Blocking is probably the most important feature in Qualtrics as it allows researchers to create question groups and manipulate them using other features in Qualtrics. Blocks are also critical for the use of the Survey Flow feature of Qualtrics. Survey flow allows researchers to adjust the question order a participant will see depending on the answer the participant chooses to a specific question. For example, in our study, if a participant reads the consent form and decides they do not want to participate in a study, we will set the flow to end the study immediately.

Random assignment is another critical feature used in Qualtrics. It allows researchers to set up specific question blocks to randomly assign questions within the blocks. In our study, the participant will be randomly assigned to either the MEC with Forced Choice Response options or Rating Scales. Within each of those, participants will be randomly assigned to two-word phrases, imagine yourself as, or a person feels like. Finally, for the rating scales, participants will be randomly assigned only 10 of the 30 items for the first task.
DATA ANALYSIS
We will correlate the two MSCEIT scores (Faces and Pictures) with the 20 MEC scores (5 tasks, with 2 response scales, with 2 scoring methods). Tables 2 and 3 show an example of how these correlations might look.

<table>
<thead>
<tr>
<th>Response Format</th>
<th>MEC Item</th>
<th>MSCEIT Task</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Faces</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pictures</td>
<td></td>
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</tbody>
</table>

### Table 2
Correlations between the MEC and MSCEIT for Proportion Consensus Scoring

<table>
<thead>
<tr>
<th>Response Format</th>
<th>MEC Item</th>
<th>MSCEIT Task</th>
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<tbody>
<tr>
<td></td>
<td>Faces</td>
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<tr>
<td></td>
<td>Pictures</td>
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</tbody>
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CONCLUSION
The MEC (Barchard et al., 2012) is measures participants’ ability to perceive the emotional connotations of written language. If MEC scores correlate with MSCEIT emotion perception tasks, this suggests MEC is a valid test of emotion perception. If some of the MEC tests, scoring methods, or response options have higher correlations, then this means that the ones with higher correlations are more valid for testing emotion perception. This could be critical for companies who wish to recruit employees who will be dealing with emotionally sensitive topics in an online environment. For example, a company that needs to hire online counselors or customer service representatives might benefit from using the MEC to determine the potential success of the applicants.

REFERENCES


ABSTRACT
The effects of trauma experienced by survivors of sexual human trafficking has been an under-researched topic in the psychological community. Very little research has addressed the best methods to treat the complex emotional and psychological consequences that many individuals struggle with after being recovered from the industry of sexual slavery. The focus of this study is to review the current literature on the psychological and emotional implications associated with human sex trafficking and to analyze the components of narrative therapy and its previous application in treating domestic abuse trauma similar to that experienced by survivors of trafficking. This paper will explore the viability of narrative therapy as a method to treat the complicated traumas and stress developed as a victim of sexual trafficking. The ultimate goal of this literature analysis is to propose a study that utilizes narrative therapy as an approach that is adequately cross-cultural and also assists with the recovery of rescued individuals to help their transition back into a healthy lifestyle. The proposed study will gather 25 female survivors of the sex-trade of various nationalities. They will range between the ages of 18 and 26, and will be in the process of attaining a temporary visa (T-Visa) in order to remain in the United States. The proposed study will employ a method of narrative therapy to determine how effective it is in accommodating the needs presented by this demographic. To measure the success of narrative therapy for the proposed study, the Posttraumatic Stress Diagnostic Scale will be utilized to identify the patient’s symptom severity before, during, and after treatment. Based on the literature analysis, this paper concludes that narrative therapy could adequately fulfill the therapeutic needs presented by survivors of human trafficking, and assist in re-establishing their psychological and emotional well-being. The proposed method of study for this population shows promise for becoming a successful method of treatment in the psychological recovery of sex trade survivors.
INTRODUCTION
The purpose of this study is to determine if narrative therapy will be an effective mode of therapy that will assist survivors of the sex-trade in improving their mental health and coping with emotional trauma. The area of human services for sex trafficking survivors is still in its infancy, but is a compelling field of research because of the clients’ distinct experiences and the resulting psychological and emotional impact. The psychological community at-large has yet to recognize that treatment of persons recovered from human trafficking requires greater attention and further research in order to provide successful treatment. Nancy M. Sidun, PsyD, supervising clinical psychologist for Kaiser Permanente Hawaii Region and chair of the original Div. 52 Trafficking Task Force states that “Psychology as a discipline is behind the times in acknowledging trafficking” (Clay, 2011, p.72). She goes on to explain that “the emphasis thus far has been on prosecuting perpetrators and tending to victims’ immediate practical and medical needs rather than addressing the psychological damage that being trafficked can cause” (Clay, 2011, p.72). Survivors of sexual exploitation often struggle with trauma associated with forced isolation, verbal and physical abuse, neglect of their basic necessities of living, generalized anxiety, depression, learned helplessness, emotional distress, and complex posttraumatic stress disorder (Clay, 2011). When combined, these clinical issues require very unique psychological approaches that address the emotional and cognitive traumas of the past as the clients regain control of their future and living situation.

The focus of this research is to fill the gap between the time when survivors emerge out of the trafficking situation and transition into a healthy lifestyle. It is necessary to provide an appropriate therapy that focuses on the diverse unconventional needs of their demographic. The challenge lies in applying a successful treatment that can cater to cross-cultural factors because of the varying international demographics used for this study. Narrative therapy is a therapeutically flexible method that has been proven to serve clients from a large range of cultural diversity “because of its deconstruction of cultural and social narratives as well as its use of social justice perspective and metaphors of overcoming oppression” (Winke, 2010, p. 238). Specifically it has been applied as a therapeutic method for abused women from Europe, as well as behavioral problems and issues with diversity experienced by biracial youths (Brown & Augusta Scott, 2007; Milan & Keiley, 2000).

LITERATURE REVIEW
The Traumatic Effects of Sex Trafficking
Human sex trafficking is a form of involuntary servitude that forces an individual into a lifestyle of physical exploitation, emotional distress, and psychological degradation. Sex trafficking is legally defined as “the recruitment, harboring, transportation, provision, or obtaining of a person for the purpose of a commercial sex act” through the use of force, fraud, or coercion (Victims of Trafficking and Violence Prevention Act, 2000). It is difficult to gain an exact statistic for the amount of people employed within the human trafficking industry but it is estimated that within the U.S. alone, 14,500 and 17,500 people are internationally smuggled into the U.S each year (Domestic Human Trafficking, 2008). Very little academic literature has gone into depth about the severe psychological repercussions of living within the confines of sexual slavery. Experiences differ widely from person to person in a trafficking situation. Some experience the worst atrocities as their freedom and physical safety are greatly compromised because of abuse, forced living conditions, and other tactics to emotionally and psychologically weaken them so as to become more submissive to their captors and clients. Many others are subjected to less physical abuse, but still experience the psychological torment of being a captive and sexual slave, as well as fear of their family and themselves being harmed if they resist or attempt to escape.

A report published by Zimmerman et al. (2006) from the London School of Hygiene and Tropical Medicine analyzed the prevalence of physical violence, sexual violence, threats, and psychological abuse of European women who had been trafficked. Among the 207 women interviewed for this study, 158 (76%) reported that they had been physically assaulted by their traffickers, pimps, madams, and brothel or club owners (Zimmerman et al., 2006). Their experiences of being sexually coerced or forced to do sexual acts was also reviewed by researchers. A total of 186 (90%) of the
207 interviewees reported having been forced or intimidated into sexual activities. A total of 148 (71%) disclosed that they had experienced both physical abuse and sexual coercion simultaneously (Zimmerman et al., 2006). Most of the women in the study also experienced limitations on personal movement and loss of freedom during their time in forced prostitution. Of the 207 women interviewed, 180 (87%) were never or very seldom allowed freedom of movement, and were essentially prisoners confined to their brothels or clubs, or to the movements of their captors (Zimmerman et al., 2006).

Many had little or no control of their basic necessities including food, sleep, or medical attention. This was seen as a tactic by their employers to establish dominance, and force the workers into dependency upon them as providers (Zimmerman et al., 2006). The reproductive and sexual health of commercial sex workers is also compromised because of their coerced engagement in high risk behavior, and this often has social and psychological challenges that complicate their lives after the trafficking situation (Zimmerman et al., 2006). Many women leave their trafficking experiences with HIV and other chronic STI infections, unwanted pregnancies, fertility loss, genital scarring, and negative attitudes associated with sexual activity (Zimmerman et al., 2006).

The research team explored the mental health implications associated with the stressful experiences of this exploitative industry. They assessed the most common psychological reactions associated with traumatic events: depression, anxiety, and posttraumatic stress disorder (Zimmerman et al., 2006). Depression was the most persistent symptom reported. Ninety-five percent of the women interviewed experienced high levels of depression, and it proved to be the most persistent symptom over the 3 month interview process (Zimmerman, et al. 2006). Even after 90 days, 75% of women still reported experiencing feelings of deep sadness and loneliness (Zimmerman et al., 2006). Within the same category of depression, feelings of worthlessness were highly common (78%) because of their experience of being ‘bought and sold’ and the resulting feelings of being physically dirty or corrupted (Zimmerman et al., 2006). These results demonstrate that the experience of having been a trafficking victim greatly affected their self-image and identity. Symptoms of anxiety, fearfulness, and nervousness ranged from 85% to 91% in their first interview (Zimmerman et al., 2006). This can be explained as residual emotion from the constant fear and stress endured. Their reaction to the physical abuse, threats, and coercion, resulted in constant worry for their safety and the burden of habitual distress. Fifty-six percent of women reported symptoms that indicated they were suffering from posttraumatic stress disorder as classified by the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (Zimmerman et al., 2006). Recurrent thoughts and memories of terrifying events were reported as being the most pervasive thoughts each day by 75% of women (Zimmerman et al., 2006).

The psychological ramifications of these overlapping experiences can lead to complex forms of trauma and difficult mental and emotional hardships. The severe distress experienced by sex trafficking survivors requires therapeutic processes that address the damage to their self-identity as a result of the disturbing experiences endured. Successful therapy must foster a strong sense of self that allows survivors to gain control over their emotions and living situation as they adjust back into a healthy and stable life.

The Components of Narrative Therapy
It is important to understand the approach that narrative therapy uses in order to recognize why it has effectively been used cross-culturally and in cases of traumatic experiences. Narrative Therapy uses an approach that engages clients in dialogue to increase what the creator of narrative therapy, Michael White, calls ‘personal agency’ (as cited in Winek, 2010). White explains that “personal agency is the capacity for responsible action”, which entails that the client establish control of their emotions, reactions, and interpretations of events (as cited in Winek, 2010, p. 229). Survivors of sexual human trafficking often struggle with regaining a sense of power because of their lack of control in the industry in which they worked. They are often deprived of the basic necessities of life, are forced into isolation, and have little control over where they go and their choice of “clientele.” Establishing their personal agency would be a positive step in helping re-write their life narrative and move
forward in overcoming what has become their ‘dominant story’. Narrative therapy utilizes the philosophy that every person’s life contains stories that can be dominant over others, and these dominant stories have a heavy influence on personal identity (Winek, 2010). Because of the powerful nature of this prevalent story, it is possible for a strong dominant story to take over a person’s self-definition (Winek, 2010). Proponents of narrative therapy believe that it is most effective for clients to learn that alternative stories can exist within their lives, and a new identity can be formed once a client embraces an alternate life-story. White and Epston (1990) establish that there are “aspects of lived experience [that] fall outside of the dominant story and provide a rich and fertile source for the generation, or regeneration, of stories” (p. 15).

It will be important for clients who are survivors of the sex-trade to understand that they are capable of overcoming the effects of their complex trauma, and that a new identity can be formed which does not revolve around the label of having been a victim of human trafficking. Brown and Augusta-Scott (2007) explain in their research with narrative therapy that “thinking about identity as fluid allows for the possibility for movement from an identity that focuses only on being victimized by the trauma to one that includes having survived and resisted. People can reshape their identities from defining themselves only in relation to the traumatic experience to having identities that also involve other elements of their lives” (p. 235).

Externalizing the issue leads directly to the next step of ‘reauthoring’. According to Winek (2010), reauthoring is the process of co-constructing a new reality and new dominant story that is free of the problem, which reduces the hold of the present problem on the client’s life. This technique produces a new reality for the client and allows this individual to resist the influence of the problem, empowering them to gain control of their reactions to past events and reformation of a stable identity (Winek, 2010). Part of the process of reauthoring is ‘highlighting unique outcomes’, which were experiences and actions before the start of therapy that run counter to the dominant story of a client (Winek, 2010). In the case of human trafficking, these would be previous attempts in which the client took action against her perpetrator in some manner, attempted to protect her own person, or resisted the effects of trauma on her own. This phase of treatment emphasizes how significant these actions were in resisting the trafficking event and the resulting trauma, and recognizes the client’s achievements in standing up to the problem in an effort to show that they possess the ability and fortitude to overcome the traumatic event.

Previous Applications of Narrative Therapy
Narrative therapy has been particularly helpful in providing treatment for an array of intimate and sexually based traumatic experiences such as childhood sexual abuse, incidents of rape, and wife assault or spousal abuse (Brown & Augusta Scott,
2007). Narrative Therapy for Women Experiencing Domestic Violence: Supporting Women's Transitions from Abuse to Safety discusses the practical use of the narrative approach in helping victimized women regain their identities and assist in their transition from victim to survivor (Allen, 2011). This qualitative research integrated the use of narrative therapy as an effective treatment for battered women recovering from emotionally and psychologically abusive situations, and draws on the interviews of women experiencing abuse to present evidence for the viability of this approach.

The interviews of 10 Irish women discussed in the text revealed very similar experiences to those endured by victims of human sex trafficking, including the prevalence of physical violence, sexual abuse, emotional and psychological torment, the loss of freedom of movement, and forced isolation due to their intimate partners limiting outside contact with friends and family (Allen, 2011). The research reviewed narrative therapy as a viable method of treatment that provided specific attention to the unique needs of those recovering from trauma and abuse, and was grounded in the analysis of the interviews given by the participants and the current research on domestic violence and contemporary therapeutic approaches (Allen, 2011). This research concluded that narrative therapy utilizes procedures for the development of new life narratives that accommodate abusive trauma while encouraging growth, coping with previous events, and resilience (Allen, 2011).

The Legal Process: A Potential Obstacle in Therapy

Working with a population that is likely applying for T-Visa status during the time of therapy offers unique challenges that must be acknowledged in order to administer successful treatment while their immigration status is pending. A T-Visa is a temporary visa that provides legal status to a trafficking victim who may otherwise be undocumented (Victims of Trafficking and Violence Prevention Act, 2000). After a 3 year period, the person can apply to become a permanent resident (Adjustment of aliens in T nonimmigrant classification, 2009). After 5 years as a permanent resident, the person can apply for full U.S. citizenship (Requirements of naturalization, 1996). Three very important aspects of eligibility for a T-Visa require applicants to demonstrate that (1) they are or have been a victim of a severe form of trafficking, (2) have complied with reasonable requests for assistance in the investigation or prosecution of acts of such trafficking, and (3) would suffer extreme hardship involving unusual and severe harm upon removal or deportation to their country of origin (Victims of Trafficking and Violence Prevention Act, 2000). To fulfill the specific requirements for the application, the trafficking survivor must provide a 'declaration', which is often drafted by an attorney. The declaration provides evidence of the individual’s victimization and affirms all relevant and credible testimony to the use of force, fraud, or coercion (Trafficking Victims Protection Act, 2000).

Many concerns arise for the T-visa applicant that includes re-traumatization, re-victimization, and difficulty with establishing a self-identity (Mayo, 2012). The process of writing a declaration has the potential to create conflict within the client’s interpretation of the trafficking event during therapy. The opposing conditions that the legal process and the therapeutic process place on the trafficking story conflict with one another, and must be acknowledged in therapy with the client so that it does not counteract therapeutic progress. The declaration must focus on their suffering, describing themselves as victims of their persecutors and their native land” (Mayo, 2012, p. 1487). It must portray the client as a powerless victim of exploitation in an effort to provide substantial evidence for their case in order to stay in the United States (Mayo, 2012).

The redacted declarations of T-Visa applicants supplied by the Immigration Clinic at the University of Nevada, Las Vegas, Boyd School of Law for this research confirm that declarations generally focus is on the disturbing aspects of the client’s trafficking experience, their inability to prevent these events, and the client’s position as a victim. In this way, declarations have the potential for reinforcing the ‘dominant story’ that the client is seeking to overcome in therapy. Common themes highlighted in the declarations characterize the individuals as having an overwhelming lack of control in the trafficking situation, being helpless to resist the aggressive behavior of their perpetrator, and highlight the negative incidents in their lives prior to trafficking. The purpose of the declaration is to define the individual as a victim...
and highlight what is relevant to the trafficking case, while the approach that narrative therapy utilizes strives to redefine the individual as a survivor. It is necessary for the declaration, which is often edited by the lawyer to fit legal framework and requirements of the case, to focus on what is legally relevant and making the survivor into a victimized plaintiff in order to successfully gain refuge for the client. Yet, this process may interfere with the therapeutic goal of helping the client to frame her own story and separate the negative experience of trafficking from her identity. ‘The victim narrative becomes a victim identity--an 'extremely limiting' role that leaves no room for any other features of a person’s identity’ (Mayo, 2012, p.1505). Not only can the legal process interfere with therapy by re-stigmatizing the client as a victim as she endeavors to move beyond that label, but efforts that directly address an individual’s experience of trauma may be harmful and lead to re-traumatization because the client has yet to build the skills needed to adequately manage her reactions and emotions (White, 2011).

The declaration needed for a trafficking case requires the survivor of sexual coercion to be redefined as a victim of trafficking, which can create tension between the disempowering aspects of the legal process and the re-establishment of personal agency in therapy. It is important to note, however, that the ultimate results that the legal process delivers to the client—acquiring legal status, the right to work in a non-exploitative environment, and the potential prosecution of the perpetrators—can result in an empowering experience for the client and may help her find closure on this aspect of her life.

**Summary of Literature Review**

Very little academic literature has explored the severe psychological and emotional repercussions of sex trafficking, but what has been discovered indicates that fear, depression, and symptoms of posttraumatic stress disorder are persistent struggles for survivors. Narrative therapy is a therapeutic approach that has successfully been applied to domestically abused women, whose experiences of abuse and coercion parallel those experienced by survivors of trafficking. Narrative therapy helps clients adjust to their life situations by helping them cope with the past as they empower themselves with insight into a more positive life story. The main focus is to externalize the events behind the trauma, and re-author the life narrative to create a new dominant story that is relieved of the issue and the stress it creates in the individual’s life. In applying narrative therapy to individuals in the process of attaining legal status, it is important to understand how the legal process might re-victimize the individual and hinder the progress of the therapeutic approaches designed to empower and reestablish a sense of identity.

**METHODOLOGY**

**Objectives and Participants**

The driving theory which guides this study hypothesizes that narrative therapy will be an effective form of psychological treatment for the trauma experienced by survivors of sexual human trafficking. The objectives for this research include establishing a new mode of therapy for victims of sex trafficking, and to provide effective counseling which focuses on rebuilding an autonomous identity as well as externalizing traumatic events in order to overcome psychological and emotional disturbances. Participants (N=25) for this study will include females, ages 18 to 26 years old. It would be ideal to work with the Coalition to Abolish Slavery and Trafficking (CAST) based in Los Angeles, the immigration clinic at Boyd School of Law, and the Salvation Army to simultaneously recruit participants and provide assistance for the population.

**Materials and Procedure**

This qualitative research design will measure symptom ratings based on the Posttraumatic Stress Diagnostic Scale, a 49 item questionnaire that gauges symptom severity and functioning (Foa, 1995). This questionnaire will provide thorough data on aspects of trauma involving anxiety, depression, and PTSD during the therapeutic process. The study anticipates that clients will be of various nationalities, and proper translations of the questionnaires will be available if necessary. It is also of interest to the study to gain the racial and demographic information of each client, and this information will be collected before therapy begins using a basic questionnaire. Over the course of 12 weeks involving a 1 hour session per week, the therapist (in collaboration with a translator if necessary) will focus on 3 distinct inquiries that will assist the client in creating a new life narrative: (1) the external narrative mode, which requires the client to elaborate and describe life events in which the story of “what happened” is addressed, (2) the internal narrative mode, which explores the
subjective feelings, reactions, and interpretation of memories related to the event, and (3) the reflexive narrative mode, which explores the meaning and interpretation of what happened and the resulting psychological and emotional effects (Angus, Levitt, and Hardtke, 1999).

Participants will be guided through the steps outlined in the previous discussion of narrative therapy, which include defining the dominant story, externalization of the problem, exploration of alternative stories, and reauthoring a new life narrative that assists in identity development outside of the perimeter of having been a victim of human trafficking. Participants will be asked to complete the questionnaires at specific intervals of therapy: before treatment, after 6 weeks of treatment, and post treatment. It is important to measure periodically the client’s potential mental and emotional progress to determine if this therapy will help with mental-emotional recovery and coping with trauma. Findings will be evaluated using either Q Local Software or hand scoring with an assessment key that is included with the testing packet. All data will be organized by evaluation period to present any change in the participant’s symptom severity over the 12 weeks of therapy. The results of this research will potentially confirm the original hypothesis that narrative therapy is an effective therapeutic method for treating the psychological and emotional traumas experienced by survivors of sex trafficking. It will also provide greater knowledge about how best to treat trauma that is related to sexual coercion and sexual abuse for this population.

LIMITATIONS
Potential limitations for this research are related to the limited subject pool who will participate in this study. It is also impossible to predict the number and availability of sex trafficking survivors applying for a T-Visa who are also gaining assistance from the CAST organization, immigration clinic at Boyd, and Salvation Army. It is for this reason that the pool of subjects remains manageable and realistic, and although all nationalities will be accepted into the study, the nature of this research is to gather qualitative data. Another limitation that can be addressed in further studies will be the generalizability of these results across the boundaries of biological sex and transgenderedness. Men and transgendered individuals are also susceptible to becoming victims of the sex-trade, and additional research for these populations is necessary to discover their psychological and emotional responsiveness to narrative therapy. In addition to the limitations of generalizability for those populations, it will also be challenging to generalize the results of survivors applying for T-Visa status to those who are not in the legal process of gaining a T-Visa. When the initial research project concludes that narrative therapy is effective in treating human trafficking related trauma, it would be an area of further study to compare these 2 groups in order to discover the extent to which the legal process has on the success of this therapeutic method. Additional research in this area would further validate the use of narrative therapy for this population.

CONCLUSION AND FURTHER STUDY
The ramifications of the sex-trade on the mental and emotional health of its survivors are an important issue to address to better to assist this population in recovery. Narrative therapy is a method that will address the underlying issues of trauma and empower them to regain stability over their life, identity, and mental health. Analysis of the previous use of narrative therapy makes it a viable resource to use for this population and the complex trauma they exhibit. Further research using narrative therapy on sex trafficking survivors in the process of attaining a T-Visa will provide a new method of treatment that simultaneously addresses the trauma previously experienced, acknowledges the potentially re-traumatizing effect of the legal process as it occurs, and allows the individual to move beyond the label of victimhood.

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THE EFFECT OF
SPIRITUALISM ON THE
COGNITIVE FUNCTIONS
OF LEARNING AND
MEMORY

BY CARLA FARCELLO

ABSTRACT
Last summer a pilot study was conducted which researched whether better working memory would be documented among an experimental group (individuals who report being spiritual) as compared to the control group (individuals who report being non-spiritual). The total scores showed a significantly higher sense of spiritualism among the spiritual participants vs. the non-spiritual participants ($p < .001$) along with a significant improvement in working memory for spiritual participants vs. non-spiritual participants ($p = .027$). The results of this study documented significantly better performance on a task measuring emotional learning and memory among individuals who reported being spiritual as opposed to individuals who reported being non-spiritual. These findings build on prior studies suggesting the effect of positive emotions on broadening cognitive processes (Strauss & Allen, 2003). This current study is building on what the prior findings have suggested and studies the effect of spiritualism on the cognitive functions of learning and memory. In addition to the Daily Spiritual Experiences Scale (DSES) used in the pilot study, the Spirituality Index of Well-Being, the Wisconsin Quality of Life Questionnaire, and the Test of Memory and Learning-2 (TOMAL-2) are included. At this time, the study is still ongoing.

INTRODUCTION
The purpose of the current study is to research the hypothesis that better verbal memory, nonverbal memory, and learning will be documented among an experimental group (individuals who report being spiritual) as compared to the control group (individuals who report being non-spiritual). Any positive findings may have implications for a variety of individuals who experience challenges with memory such as our senior population as well as those with differing brain function.

The amount of physiological-neurological research performed over the past few years has dramatically increased due to our ability to view the structure and function of the brain in living human beings. The use of imaging tools has resulted in huge strides forward in unlocking some of the mysteries of the three pound universe—the
human brain. Some of the areas in which we have made remarkable progress include neural issues associated with personality, memory, criminal behavior, impulsiveness, and moral behavior.

One of the more unique neural processes being recently addressed is the affect of belief and spiritualism—the sense of being connected to something larger than oneself—on the human brain. Substantiation of the influence of the mind on the body is plentiful. Biofeedback, visualization, meditation, and practices such as prayer and control of behavior are used in medical and psychological treatments associated with mind-body healing. A body of studies has identified prayer, specifically, as having a significantly positive influence on many brain processes and functions.

Bingaman (2011) reports that “Christian practices rather than beliefs” per se, result in less fearfulness and lowered anxiety during one’s everyday life (p. 1). Lower levels of anxiety reduce harmful cortisol concentration in the nervous system thereby leading to longer life and better overall health. Epilepsy, an invasive type of electrochemical brain disorder, has been shown to be mediated by prayer-type yoga exercise because prayer “reduces seizure frequency, relieves depression, decreases social segregation, and promotes cardiac and general health” (Khan, Ahmad, Beg, Ismail, Abd Alla, & Nubli, 2010, p. 391). While studying the affect of prayer on outcome in patients with traumatic brain injury, Vannemreddy, Bryan, and Nanda (2009) found that patients who practiced prayer demonstrated better recovery following surgery. A project assessing functional magnetic resonance imaging results of a group of Danish Christians found that brain areas associated with social cognition were highly activated during prayer (Schjoedt, Stodkilde-Jørgensen, Geertz, & Roepstorff, 2009).

The essential cognitive function of memory has also been shown to be influenced by prayer. Fabbro, Muzur, Bellen, Calacione, and Bava (1999) report that working memory tasks administered while participants prayed resulted in significant reduction of spontaneous, intruding thoughts thereby facilitating memory. Based on evidence from brain scan studies performed during the administration of memory tasks on individuals who practiced prayer and meditation, Newberg and Waldman (2009) found positive and permanent changes in the brain. Another study demonstrated a transformation of personality and increased productivity resultant from the affect of prayer on participants’ memory, imagination, and emotions (Simon, 1989).

Not only have various studies shown improvement of neurological capabilities, but the activities performed by the participants can be administered at any stage of a neurological disorder. Procedural and Emotional Religious Activity Therapy (PERAT; Vance, 2005) incorporates religious activities that are both emotionally-salient and also have a procedural memory component effective in improving memory. Compared to more common therapies like pet, art, or music therapy, the PERAT protocol requires that participants engage in religious activities which have long governed a majority of their lives. This includes, but is not limited to, reading the Bible, lighting the Menorah during Hanukkah, or facing in the direction of Mecca during prayer. PERAT has been shown to lessen behavioral problems as well as improve quality of life. Given its cognitive influence on memory, the role of prayer warrants further study.

LITERATURE REVIEW

“Our minds are like Pentium chips; they remember everything” (Foer, 2011, p. 14). However, only a minute fraction of the world’s population has ever been able to categorize information in such a way that retrieval is much like picking through a well-organized filing cabinet. I suppose one must be gifted with such a mind and many would agree. However, science-journalist and winner of the 2006 U.S.A Memory Championship, Joshua Foer, corrects this statement and declares that our minds, as hard it is to believe, really are capable of remembering everything. According to Foer, we just need to learn how to think in memorable ways (Foer, 2011). There is an art to memorization. Originally invented in Greece by the poet Simonides, the Method of Loci has been used successfully to enhance long-term memory ever since Italian Orator Cicero memorized his speeches (Foer, 2011). This technique was also used by Christian monks who memorized every verse in the Bible and recited them via spoken word and paper.

People used to spend hours perfecting memorization techniques, which is unheard of
We do not have a need to perfect our minds in such a way because we have technology to supplement our long-term memory. When you telephone a friend, do you have their number memorized by heart or is the phone number stored in your phone? It seems as though we no longer completely trust our minds with all important information.

In 2008, brain gyms and memory boot camps were a growing fad and brain training software was a 265 million dollar industry (Foer, 2011). This appears to be contradictory. We do not trust our minds with all valuable information yet we spend millions of dollars training our brains to perform tasks that we end up relegating to technology. Part of the 265 million dollar gross expenditure was allocated to recent research demonstrating that exercising one’s brain may ward off both Alzheimer’s disease and progressive dementia (Foer, 2011). Could spirituality cause the same effect regarding memory? Can it be that our “thinking in a memorable way” will organize our own personal filing cabinet in our minds? Could spirituality help patients with Alzheimer’s disease and types of dementia?

While extensive information exists in regard to memory, spirituality has only been recently gaining attention in academia. Spirituality has long been an integral part of human culture yet science has rarely tried to unlock an understanding of the effects resultant from such practices nor has science acknowledged spirituality as a variable to be considered in empirical health research. Spirituality is something which can have various meanings and be experienced in different ways according to each person. There are many forms of yoga, meditation, and prayer all designed with a goal of getting closer to God or experiencing enlightenment and oneness with the world around oneself. Prayer is just one aspect of spirituality that is widely practiced and yet treated mostly without regard to its cognitive content or cultural framework (Wuthnow, 2008). For the purposes of this study, spirituality is defined as a belief in something higher than oneself.

The words “God” and “science” are almost never uttered in the same sentence without hostile connotations behind them. One might ask why is this so? “No matter how hard we try, the ultimate nature of the universe continues to elude our brain” (Newburg & Waldman, 2009, p. 4). Neuroscience may not be able to answer questions about where humans originate, but it can record the effect that religious beliefs and experiences have upon human brain processes such as cognition (Newburg & Waldman, 2009).

“Furthermore, it can tell us how God—as an image, feeling, thought, or fact—is interpreted, reacted to, and turned into a perception that feels meaningful and real” (Newburg & Waldman, 2009, p. 4). With approximately 95% of all Americans claiming to have a religious or spiritual affiliation (Bonner, 2002), conducting scientific research related to spirituality would not only help clinicians with diagnoses for their clients, but would also help develop better practices for pastoral psychology/ministry (care and counseling), and provide a better understanding of cognitive processes.

Vannemreddy, Bryan, and Nanda suggests that “Quality of life is a multi-dimensional construct composed of functional, physical, emotional, social, and spiritual well-being” (2009, p. 264). There have been many past studies which suggest improved emotional states, such as lower levels of anxiety and depression, and a better health-related quality of life including greater longevity, coping skills, and quicker recovery from illness, experienced by individuals who practice a form of religious involvement and spirituality (Vannemreddy, Bryan, & Nanda, 2009).

Bingaman claims that something transcendental is involved with the mind, consciousness, and the path of awakening—call it God, Spirit, Buddha-nature, the Ground, or something else. Whatever name it goes by, the transcendental dimension is ultimately beyond the physical universe (2011). Bingaman further claims that recent neuroscientific research has revealed that the human brain, far from being fixed and unalterable as it was once thought to be, has an astonishing capacity for change, continued growth, and for transforming its very own structure (2011). This revelation in neural research is referred to as the neuroplasticity revolution.

This unique transformation of the brain does not happen over night or during a short span; the changes, according to Bingaman, are tiny.
incremental alterations in neural structure that add up as the years go by (2011). Our brain does not stop learning at a certain age; it just takes longer to produce any detectible changes. Learning a new language at a more mature age has long been thought of as an impossible task. With new neuroimaging brain scans of Buddhists in mindfulness meditation documenting “tangible changes in a client’s neural circuitry and brain structure” (Bingaman, 2011, p. 479), we should reconsider what our minds are capable of.

With the anticipated quadrupling of Alzheimer’s disease cases to 20 million in the next two decades, a new approach called Procedural and Emotional Religious Activity Therapy (PERAT) has been helping improve the cognitive functions of individuals with Alzheimer’s disease and related dementias using spiritually-laden activities (Vance, 2005). Compared to the popular pet, art, and music therapies typically administered, PERAT better holds the attention of the patient and shows greater cognitive gains (Vance, 2005). Montessori activities are the only other therapies which exhibit the same subtle cognitive gains (Vance, 2005). PERAT focuses on finding activities that are meaningful and within the adult’s cognitive range (Vance, 2005). The activities focus on procedural memory skills and emotional attachment, automatic or unconscious memory and mental feelings which remain intact during most of dementia stages as opposed to executive, and explicit memory skills which include the abilities to reason and to consciously recall information (Vance, 2005). These are the first of the cognitive systems to deteriorate in patients with dementia (Vance, 2005). The therapy can be used with various religious and spiritual paradigms. Patients of the Catholic faith, for example, would recite the Rosary, recite popular scripture, or hold religious symbols. Patients of the Islamic faith would face towards Mecca to pray and patients of the Jewish faith would light a menorah (Vance, 2005). With continued studies of PERAT involving other forms of dementia such as Parkinson’s disease and Huntington’s disease, this therapy shows great potential in providing motivating and meaningful activities for patients.

“Various rituals of faith can be effectively used with the Christian older adult as spiritual care interventions and memory reminders or memory joggers of both who they are and where they are and whose they are” (Mooney, 2004, p. 187). According to Mooney (2004), for individuals with Alzheimer’s dementia, the sense of personal identity and the memories that shaped their sense of identity have gradually become swallowed up in a sea of forgetfulness that results in what has been described as the very “loss of self” (p. 184). Spirituality may help regain that “lost self” for patients.

Another study used spiritualism as a positive life theme to determine cognitive bias in individuals. Verno, Cohen, & Patrick (2007) studied community-dwelling adults’ cognitive processing using a positive life theme of spirituality as a schema. Their hypothesis contended that “spirituality may result in cognitive bias in which highly spiritual adults focus on positive rather than negative elements in their environment” (Verno, Cohen, & Patrick, 2007, p. 1).

Several hypotheses were tested with an expected interaction between age, spirituality, and type of word recalled. Previous studies have shown that the most spiritual age range is of the older adults. Due to these results, older adults were hypothesized to display a cognitive bias toward positive words on the memory tasks. The study showed, in contrast, that spirituality did not appear to be related to a positive bias and did not indicate spirituality to be linked to different styles of cognitive processing (Verno, Cohen, & Patrick, 2007).

In contrast to studies which support evidence with a connection between neuropsychology, neuroscience, and spirituality, Teske claims, “If we are to arrive at a theological system that is coherent with science, we need to see how our neuropsychology is necessary for our spirituality” (Teske, 1996, p. 209). Human spirituality requires capacities for reflection, for self-knowledge, and for self-transcendence. These capacities are, however, limited in humans. “These capacities require a neuropsychological endowment sufficient for mapping, modeling, or symbolically representing a world and a self within it” (Teske, 1996, p. 210). Such capacities entail limits that, as spiritual beings, we need to acknowledge. These include four different types of limits (Teske, 1996). The first limit is that selection entails limitation. Knowing about the world and being able to represent the world in useful ways will always...
involve a process of selection; perceiving the world to the individual’s advantage. The result of this perception is that our representation of the world will be incomplete, limited, or even distorted in the direction of the individual’s values. The second limit is that abstraction entails separation. Knowing about the world involves a process of abstraction across objects or events. This abstraction enables us to escape from the particulars of our immediate circumstances, generalize, and respond to new situations. “The result is that our relationship to the world is always mediated through abstractions and will be separated from it, losing the uniqueness of concrete relationship” (Teske, 1996, p. 210). The third limitation is that construction entails fabrication. Knowing about the world involves building representations which can happen in multiple ways. “The result is that our knowledge of the world is always perspectival and is likely to be egocentric, fabricated, and self-deceptive” (Teske, 1996, p. 210). The final limitation is that specialization entails partition. “Knowing about and functioning within a complex world requires specialized parts and specialized representations” (Teske, 1996, p. 210).

In a limited-capacity system, this results in some degree of partition of modularization. This always runs the risk of fragmentation as the system differentiates and communication between elements decay. “Like knowledge of the world in general, knowledge of oneself is selective, abstract, constructed, and specialized” (Teske, 1996, p. 210). Even fragile self-knowledge can point to the limitations and finitude we hope to transcend. “Our spiritual life is made possible, and given its challenges, by the appropriation of symbolic meanings that constitute conscious mental life” (Teske, 1996, p. 210). The central challenge is to construct, to represent, and to symbolize the self which is our only support of personal wholeness. This pursuit of integrity, as much a spiritual as a psychological pursuit, is dependent upon our neuropsychology but not required by it (Teske, 1996).

The purpose of the current study is to analytically research our hypothesis which sets forth that better verbal memory, nonverbal memory, and learning will be documented among the experimental group who report being spiritual and engage in prayer. These findings have very important implications regarding the potential of prayer to improve memory function in individuals of different ages and perhaps with differing brain function. Although beyond the scope of this project, we hope to follow up on this study by broadening the definition of our participants to include a wider age range, more diverse ethnicities, and individuals with cognitive injuries or disorders.

**Summary of Literature Review**
While extensive information exists in regard to learning and memory, spirituality has only been recently gaining attention in academia. Spirituality has long been an integral part of human culture yet science has rarely tried to unlock an understanding of the effects resultant from such practices nor has science acknowledged spirituality as a variable to be considered in empirical health research. Therapies like Procedural and Emotional Religious Activity Therapy (PERAT; Vance, 2005) and new research provides evidence that spirituality has the potential of being “memory reminders” for Alzheimer’s disease and dementia patients and improve quality of life for the patients (Mooney, 2004). Given its neurocognitive influence on memory, the role of prayer warrants further study.

**METHODOLOGY**

**Participants**
Study participants from the University of Nevada, Las Vegas will include 40 individuals; an experimental group of 20 healthy adults aged 18-30 years who consider themselves to be spiritual (the sense of being connected to something larger than oneself) and a control group of 20 healthy adults aged 18-30 years who consider themselves to be non-spiritual. The participants will be recruited through flyers posted throughout the University of Nevada, Las Vegas campus.

**Materials**
Our materials include three scales and one demographic questionnaire. The first scale was the Test of Memory and Learning-2 (TOMAL-2). This measure is a revised version of the widely used TOMAL and is considered a comprehensive instrument designed to evaluate general and specific memory functions of individuals aged 5 to 59 years old (MHS, 2012). The TOMAL-2 encompasses an expanded age range, along with shorter administration times and easier scoring (MHS, 2012). With eight core subtest, six
supplementary subtests, and two delayed recall tasks, the TOMAL-2 can be efficiently used to evaluate those who may be believed to have learning disabilities, traumatic brain injury, neurological diseases, serious emotional disturbance, and Attention-Deficit Disorder (ADD) (MHS, 2012).

The second scale was called the Underwood’s Daily Spiritual Experience Scale (DSES). Lynn Underwood of Hiram College designed this 16-item Likert-type self-report measure to assess ordinary experiences of connection with the transcendent in daily life (Underwood & Teresi, 2002). This scale requires answers of: Many times per day, Every day, Most days, Some days, Once in a while, and Never/almost never (Loustalot, Wyatt, Boss, May, & McDyess, 2006). “Many times per day” represented the lowest numerical category (1) and “Never/almost never,” represented the highest (6). Question 16 “In general, how close do you feel to God?” will be scored differently. Responses to this item include: Not close at all, Somewhat close, Very close, and As close as possible. These responses will be scored from 1 to 4 with 1 being “As close as possible” and 4 being “Not close at all” (Loustalot, Wyatt, Boss, May, & McDyess, 2006).

Loustalot, Wyatt, Boss, May, & McDyess (2006) examined the test-retest reliability of the Daily Spiritual Experiences Scale. The data for the study was gathered on two occasions, 2 weeks apart, from a convenience sample of 40 African American adults (Loustalot, Wyatt, Boss, May, & McDyess, 2006). “Criterion validity, represented by concurrent validity, was assessed in this study with ANOVA methods” (Loustalot, Wyatt, Boss, May, & McDyess, 2006, p. 165). The findings provide evidence that the 16-item DSES is stable over time and internally consistent.

The third scale was the Spirituality Index of Well-Being. It is a twelve item questionnaire created in order to measure the impacts of spirituality on subjective well-being (Daaleman & Frey, 2004). It was originality designed to examine spirituality in health-related quality of life studies. The two overarching themes that this index examines are self-efficacy and life scheme (Daaleman & Frey, 2004).

**Procedure**

Qualified participants will be scheduled for testing sessions Monday thru Saturday from 9am-6pm. Upon arrival at the testing room, each participant will be greeted and taken to a private, sound proof study room in CBC-501. The informed consent form, demographic form, Spirituality Index of Well-Being, and the DSES measure will be administered first. Then, the TOMAL-2 will be administered. After the TOMAL-2 is completed, each participant will be compensated $10.00. The data will be analyzed by comparing the scores from the TOMAL-2 to the DSES and the Spirituality Index of Well-Being.

**FURTHER STUDY**

Once finished with the current study, we hope to follow up by broadening the definition of our participants to include a wider age range, more diverse ethnicities, and individuals with cognitive injuries or disorders. One limitation to our current study is that we do not include participants who claim to be agnostic. Including agnosticism may give us a better understanding of the relationship between spirituality and memory.

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ABSTRACT
Previous randomized controlled trials of Short Message Service (SMS) technology in smoking cessation interventions have been proven to be effective. Upon the completion of our pilot study, we will investigate the combined effects of delivering self-help SMS text messages with candidates that rate < 8 on the Contemplation Ladder (intention to quit scale) in natural-based setting. A sample of (N=60) adult smokers from the Eugene Community intending to quit will come in our lab for two sessions (baseline and follow-up) where physiological tests and self-reports will be measured. Smokers will be allocated to one of three condition groups where they will be sent 6 text messages per day for four weeks. Our results showed significant positive outcomes. In addition, over forty participants from the self-generated group reported a drastic reduction of cigarette smoking than the control group. Subjects from the self-generated with implementation intention condition reported a slight increase in self-efficacy over participants in the self-generated condition. These findings demonstrate the efficacy of SMS text messaging in a smoking cessation intervention conducted under natural-based settings.

INTRODUCTION
Various randomized controlled trials of Short Message Service (SMS) technology in smoking cessation interventions have been tested for effectiveness in professional institutional settings. Upon reviewing the available literature reviews, we were able to conclude the efficacy of utilizing interactive text-based SMS technologies; which is especially effective in aiding participants in real-world settings. Specifically, the focus of this study is on smoking cessation using SMS messaging intervention. Subjects who are intending to overcome their nicotine addiction will be randomly allocated to one out of three conditions. We will investigate the combined effects of delivering self-help SMS text messages under these three conditions in a natural-based setting. Subsequently, we will explore these two factors and through our findings, contribute to current
literature reviews. Consequently, our study will encourage other prominent health facilities and institutions to conduct further randomized pilot studies. Finally, through our findings, current confounding factors will be reduced.

**LITERATURE REVIEW**

Current studies suggest almost half a million tobacco users die each year from tobacco related illnesses; excluding the death rates in evolving countries (Sellers, Tynadle, & Fernandes, 2005). Presumably in the United States, recent studies suggest over half a million people die each year from tobacco related illnesses. Consequently, nicotine addiction is the number one leading cause of preventable deaths worldwide (Spring, Pingitore, McChargue, 2003).

Addiction to nicotine is a chronic disease that affects both active smokers and passive, second-hand smokers alike. According to a recent article, developing countries account for over seventy-eight percent of tobacco-related fatalities (Bitton, Green, & Colbert, 2011). Similarly, another study conducted in Mexico by Secretaria de Salud, Consejo Nacional Contra las Adicciones (CONADIC) suggested that smoking tobacco is more predominant among males than females. These results are minute compared to the current global fatality rates which exclude the deaths of passive smokers (Samet, 2008).

Lastly, a poll conducted by The World Health Organization reported last year that the Yearly Global Death Rate from nicotine to addiction, related diseases and passive smoking surpassed thirty million fatalities, and this number is typically expected to increase by at least a million more fatalities in the next two years. Similarly, other research articles support these findings as well (2011).

**Implications of Nicotine Addiction**

Abstinence from nicotine will result in minor to extreme withdrawal symptoms (Marlow, & Stoller, 2003). These symptoms can cause spontaneous relapses during an intervention. On one particular study, participants reported a wide array of symptoms such as: experiencing an extreme craving for cigarettes, irritableness, increased anxiety, insomnia, and inability to focus (Hughes, 2007). These recurring symptoms may deter potential smokers looking to quit smoking to abstain from seeking help in smoking cessation programs.

**Health: Negative implications from smoking tobacco**

In addition to illnesses effecting smokers and passive smokers, other contending macro-societal economic factors indirectly affect the rest of the population. For example, a literature review concluded the following findings: “Direct costs according to the human capital approach. Results: the costs of acute hospital care, in-patient rehabilitation care, ambulatory care and prescribed drugs were 9.3 billion DEM, of mortality were 8.2 billion DEM and costs due to work-loss days and early retirement were 16.4 billion DEM (discount rate 3%). The total added costs added up to 33.8 billion DEM, 415 DEM per inhabitant or 1,599 DEM per current smoker” (Welte, Konig, & Leidl, 2000). These results clearly support the importance of smoking cessation interventions. It implicates the negative socioeconomic outcomes which are associated with habitual smokers.

Overall, similar articles implicate the negative effects of smoking at work by significantly reducing work productivity. In conclusion, the statistical outcomes solidify the importance of intervention application among all populations (Welte, Konig, & Leidl, 2000). Further studies will aid educational institutions in the development of effective intervention implementation.

**Interventions**

The wide variety of smoking cessation interventions are steadily increasing in large numbers. Some of these costly interventions include: acupuncture, inhalers, nicotine patches, nicotine gum, pharmaceutical pills, guided imagery, and other cognitive strategies used to regulate persistent cravings (Kouvonen et al., 2012). Many of which are ineffective and/or inaccessible to the low-income population; this may help explain the unexpected plateau in the rate of adult smokers looking to quit (Curry, Grothaus, & McBride, 1997).

Indeed, effective and inexpensive smoking cessation programs are needed to reach the low and medium-income population. Importantly, an innovative smoking cessation program involves
the use of cell phone short-message-service and is necessary to target the two confounding variables that impede various populations from seeking professional help. The usage of SMS text messages are growing rapidly among both culturally diverse and low-income populations. The systematic use of SMS texts allow the experimenter to simultaneously treat and communicate with any subgroups from virtually any location (Fjeldsoe, Marshall, & Miller, 2009). Importantly, it allows the experimenter to receive instant personalized feedback. This flexible response acquisition can be used to enhance the efficacy of future interventions.

Over the last decade, numerous randomized control trials have been undertaken to test the efficacy of cell phone technologies for smoking cessation interventions among college-aged students and adults. In New Zealand, almost two thousand smokers were recruited for participation in a smoking cessation intervention. Young adults were the intended sub-group population for the implementation of this intervention. The subjects were randomly assigned to one of three intervention groups.

Participants were sent five “quit-smoking” intended text messages per day for the first four weeks of the intervention. Later, the quantity of the encouraging text messages were decreased to three text messages per week, upon the completion of the first thirty days for the remaining five months. The initial follow-up session was undertaken after the first six weeks and secondary follow-up session was concluded after twenty-six weeks (Rodgers et al., 2005).

Similarly, shortly after this study, another randomized pilot study was conducted in the United Kingdom. This pilot study randomized 200 participants from various educational institutions. Similar to the prior study, subjects were randomly allocated to an intervention group solemnly based on their initial baseline responses.

During the first thirty days of the intervention, participants were sent five daily “stop-smoking” text messages. After the thirty days, the quantity of the messages was decreased to three text messages per week for a total span of five months. A total of two follow-up sessions were successfully undertaken in a similar manner as the New Zealand study; one after the first thirty days and the final session after sixth months. Both studies were able to conclude prominent results on short-term self-reported efficacy to quit smoking (Free, et al., 2009).

Additionally, a recent review added an additional component to SMS messaging intervention; the web-based support system was operationally designed to enhance the SMS-text messaging intervention by modifying the intervention to simultaneously aid subjects when encountering sudden urges of craving. This method allowed for the experimenter to respond with personalized feedback in accordance with each of the subjects’ needs.

The pilot study utilized the behavioral self-regulation theory model to create the web-based protocol for the intervention treatments. Forty-six college students between the ages of 18-25 met the initial criteria. A total of twenty-nine participants enrolled in the web-based portion of the study but only seventeen subjects completed the 6 week intervention.

Lastly, eight of the initial twenty-nine participants were able to abstain from smoking after terminating the program. These results suggest college smokers are considerably more resistant to enrolling in any educational institutional-based smoking cessation program than those adults who are under the age of 25 (Obermayer, Riley, Asif, & Jean-Mary, 2004). Therefore, persuasive techniques are needed to improve adherence and to reduce disengaging attitudes towards seeking professional assistantship in future studies.

Among other pilot studies, one recent literature review assessed several studies for high self-report efficacy and other criterion. A total of thirty-three pilot studies were evaluated for both effective behavioral outcomes and feasible treatment models. This literature review explored only one type of intervention, the usage of SMS-text messaging.

In this investigation, slightly more than a dozen of the thirty-three studies were proven to have feasible positive outcomes. Moreover, only four of the dozen reviews actually pertained to smoking
cessation interventions. We can only speculate that these findings will help reduce future methodological errors for smoking cessation studies.

**METHODS**

**Participants Recruitment**

Ninety-three potential participants were recruited from the Eugene community. Various marketing methods were exercised. Among these methods, flyers were posted on local bus stations, public light polls, department stores and public posting boards. The most fruitful method of recruitment was the posting of an ad on a local newspaper.

Approximately one hundred and fifteen potential participants replied to the SafeGuard. Furthermore, nineteen of subjects yielded disconnected numbers. Significantly, fifty-seven of the ninety-seven potential participants who received a reply from our ad proceeded to schedule an initial 20-45min telephone screening session. Moreover, four participants excluded themselves after their brief telephone session. In addition, thirty-three participants did not fulfill the eligibility criteria. Subsequently, twenty participants consented to the requirements and were scheduled for their baseline session at the University of Oregon inside the Psychology Department Building.

**Exclusionary criteria:**

1.) Under the age of twenty five
2.) Unable to read and respond to text messages
3.) Unavailable current cell phone with data plan
4.) Non-English speakers
5.) Any score < 8 on the Readiness to Quit Scale (Contemplation Ladder)
6.) Evidence of drug or alcohol dependency
7.) Evidence of possible neurological disorders. Ex: seizure disorder, brain tumor, etc.
8.) Evidence of psychiatric, conduct, and learning Disorders. Ex: Bipolar disorder, récurrent major dépression, etc.

Thereafter, a quit date was scheduled prior to the attending the onsite baseline session. Consequently, participants were informed of the potential amount of incentives they would receive upon completion of the thirty days. Lastly, participants were informed of the two required sessions and as well as the duration of these durations. Both baseline sessions and follow-up sessions were confirmed via sms text message and/or phone call, at least 24 hours in advanced.

**Measures and Procedures**

**Baseline Session**

After thoroughly explaining the purpose of our research, an explicit consent form was provided and signed. Once obtained, a detailed script was then read to the participants explaining the purpose of each physiological test they would undertake. Importantly, nicotine dependence was verified in vivo through the following practical tests; the first assessment measured the participant’s expired carbon monoxide using the carbon monoxide monitor (Micro-smokerlyzer Bedfont Scientific Ltd., Kent, United Kingdom). The second assessment measured salivary cotinine levels. Experimenter used Nicalert saliva nicotine test. Lastly, urinary samples were effectively tested for nicotine utilizing the Accutest NicAlert strip; JANT Participants were required to affirm willingness Pharmacal Corp., Encino, CA (Falk, Berkman, Whalen, & Liebermann, 2011). 

After completing the physiological tests subjects were directed to our computerized self-report questionnaire. Through our online research-based program, QUALTRICS, participants were probed for various generalized questions such as: ethnicity, age, socioeconomic status, age of onset smoking, intentions to quit, family history, number of prior attempts to quit, reasons to quit, reasons for smoking. Battery of questionnaires excluded personal identifying information.

Once the initial part of the web-based questionnaire was completed, subjects were randomly allocated to one of following three conditions: First, the FIR control group generic text messages. Second, OAK group fabricated self-generated messages with no written examples to aid them. Third, the MAPLE group was given a “cheat sheet” to aid them with initial writing of the self-generated implementation intention messages. After the participants completed the computerized web assessment, a follow-up date session was suggested and appointed. Sessions were scheduled thirty from their initial session. Lastly, an incentive was allotted for the amount of 20 dollars. Participants were sent six sms-text messages for one month. After one month,
participants were invited for their follow up session.

DATA ANALYSIS
Data will be verified for efficacy from both, physiological samples and completed self-report measurements (found in our online-program of database of questionnaires). By comparing the initial baseline measurements with the follow-up session we will determine whether our hypothesis has been proven or disproved. Predictive positive outcomes will be emphasized through a consistent decrease in the nicotine and cotinine levels on at least <35 subjects upon completion of the final physiological tests and self-report questionnaires.

RESULTS
Current Status
Approximately thirteen smokers (M=10,F=3) between the ages of 25-54 are currently partaking in our 30 day sms smoking cessation program. All current participants will terminate the program in the following week. Since our current messaging generating system QUITJUICE, can only generate text messages to thirteen participants at one time, further proactive recruitment will be required. As research assistant, I will be in charge of screening and scheduling the following group of thirteen, until the total number of participants has been met.

Hypothesized Results
Upon completion of the 30 days, final self-reports and physiological test samples from current and prospective participants will be collected and analyzed, we hope to conclude the efficacy of our smoking cessation study by utilizing sms-technology in a natural-based setting. Secondly, smokers with strong intentions to quit in the self-generated implementation intentions group will be compared from to the self-generated condition group. Promising findings will depict a noticeable change between the self-generated implementation intentions group and the self-generated group. Implementation intention group will have lower cotinine levels and increases in self-efficacy. This will confirm the efficacy of our pilot study.

Alternative Possibilities
Inadvertently, self-reports might not parallel to result from three physiological tests, which may result in inconclusive findings. Research findings might also implicate no change among the self-generated implementation intention group and self-generated groups. Consequently, either alternative possibility requires further pilot studies to be conducted. Further limitations will need to be re-examined and tested.

DISCUSSION/CONCLUSION
Previous limitations were addressed in our pilot study. Hence, results from our pilot study will yield fruitful modifications and positive outcomes to future studies. Short-term self-efficacy and intentions to quit were established in the self-generated implementation intention group. However, explicit, longitudinal studies need to be conducted to test the long-term efficacy of this study.

REFERENCES


ABSTRACT
The physiological responses that are governed by the secretion of the steroid hormone 20-hydroxyecdysone (20E) and upregulation of calcium (Ca2+) have been the subject of increasing interest. An important example of such activity involves the salivary glands of larval Drosophila melanogaster where steroid exposure causes a change in gene expression through the conformational activation of the nuclear receptor ecdysone (FBgn0000546) ultraspiracle (FBgn0003964) (EcR/USP). The EcR/USP receptor is a key protein for modulating this response. When EcR/USP binds 20E, the receptor undergoes conformational activation, modulating transcription of genes that facilitate glue secretion [1]. Recently, the importance of the USP domain of the EcR/USP receptor has been questioned, and it has been suggested that the action of the heterodimeric complex in binding to its respective promoter (and subsequent effect on which genes are transcribed), is autonomous relative to this domain [2]. Following this purport implies that there is an alternative protein that dimerizes with EcR, leading to the idea that the nuclear receptor may not be EcR/USP, but rather EcR/x (“x” representing the unknown domain). Such an outcome would set the stage for the discovery of a novel receptor responsible for 20E events. The purpose of this study is to assess the necessity of USP in affecting early developmental events in pre-metamorphic larvae. Additionally, research efforts were also focused at deep sequencing analyzation of the transcriptome of 20E for D. melanogaster. Our search yielded what appear to be promising results as discussed in this article. Genes that show an increased expression during developmental phases corresponding to Ca2+ elevation and thus may work in tandem with EcR to modulate pre-metamorphic responses will also be
discussed in this report. Any such genes identified will be compared to human databases for shared functionality in future studies.

Key Words: glue secretion; glueRED; calcium upregulation; UAS-upstream activating sequence; transcriptome; 20E; steroid hormone; ecdysteroid response; RNAi; molting; transcription factor (TF)

INTRODUCTION

Near Future Medicinal Applications of Transcriptome Analysis

Modern medicine is in many ways very non-specific. As an example, medicine today dictates that patients be screened for prevalent diseases such as cancer on an annual basis. And based on the findings of these screens, chemotherapy is usually indicated and in such cases, is the gold standard of care for patients who have been diagnosed. Although this treatment option is used with the intent of inhibiting metastatic lesions from further proliferation, it does not directly target problematic altered-self cells. In addition to the altered-self cells, it targets all of the cells in the vicinity of the cancerous legion, and is notorious for impacting patients on a systemic level.

In the near future, this method of diagnosis and cancer treatment will likely be proven to be not only outmoded, but widely regarded much in the same way as bloodletting, as most anyone who has undergone chemo would attest to its brutality. The era of personalized medicine is soon to arrive and will completely revolutionize the practice of medicine becoming the new standard of care. Treatments that utilize personalized medicine are likely to be very specific because they will be based on the patient's genome and/or transcriptome. Soon, patients will be able to see their doctor and have the option to receive a complete copy of their genome/transcriptome—relatively inexpensively—and receive specific treatment that takes into account their genetic makeup.

Next Generation DNA Sequencing (NGS) technologies are extremely powerful tools that essentially streamline the process of genomic sequencing by producing high-throughput deep coverage resulting in high resolution at relatively low costs \[3, 4\]. Through utilizing a complex interplay between the basic sciences (e.g. enzymology, chemistry), hardware, software, high-res optics and the principles of engineering, NGS is most helpful in restructuring sequencing prior to DNA analyses. Traditional sequencing techniques employed the usage of clone-based bioengineering where the construction of cDNA libraries were dependent on the utilization of a cloning vector. NGS enables investigators to bypass the use of highly automated systems that require massive amounts of equipment and complicated multistep clone-based processes—thus saving resources \[4\]. With the advent of high-throughput DNA sequencing made possible with the technology used to sequence the human genome it is now relatively simple and inexpensive to analyze the genes being expressed (the transcriptome) in a tissue, thus making it simpler to assay that tissue's response to treatment.

Overview of 20-Hydroxyecdysone (20E) and Calcium Regulation

Steroid hormones are known to control important developmental and physiological responses in animals including humans. It is also known that the way a \textit{D. melanogaster} responds to steroids similarly to the way that a mammal responds to steroids at the molecular level; this suggests that utilizing this model organism for transcriptome analyses for 20E regulated glue secretion response will enable the elucidation of steroid regulated genes that control basic physiological response. It is hoped that by studying the transcriptome of a steroid-mediated response in \textit{D. melanogaster}, efforts towards unveiling this conserved signaling pathway will yield insight towards mammalian hormone regulated responses.
Furthermore, it has been well documented that Ca$^{2+}$ plays a critical role as a secondary messenger in eukaryotic and prokaryotic cells. Typically, when bound by its respective calcium-binding protein, Ca$^{2+}$ acts as an excitatory ligand in signal transduction pathways [1]. Such physiological activity often leads to the induction of responses typically involving cascades of events corresponding to the particular protein binding Ca$^{2+}$. Calcium-mediated signal transduction pathways often result in the production of key molecules required for cellular maintenance e.g. hormone secretion, generation of action potentials, and homeostasis [6]. Although many of the calcium binding proteins that transport the calcium into the cell have been well characterized, much remains to be uncovered with respect to the etiology of Ca$^{2+}$ elevation. The nuclear receptor responsible for mediating much of the response is EcR/USP.

EcR/USP is a heterodimeric transcription factor (TF) that affects the transcription of genes related to early developmental events, (e.g. molting and glue secretion) that occurs when cells of the salivary gland uptake the steroid hormone 20E. The transduction pathway leading to calcium-mediated upregulation of the steroid hormone 20-hydroxyecdysone (20E) has gained much attention due to its now well documented role in D. melanogaster larval development. As a result of the mysterious nature concerning how these events occur mechanistically, there are a growing number of scientists that have focused their efforts on unveiling the connections between the upregulation of Ca$^{2+}$, calcium-binding proteins and the observed 20E pulses.

Evidence has been presented linking the before mentioned events in an effort to explain how these developmental responses are induced/regulated [1]. Given the laws of Darwinian evolution, it is suggested that these pre-metamorphic events coupled with upregulation of calcium-mediated pathways—including their corresponding hormones similarly regulated to 20E—may have implications analogous to embryonic development in mammalian systems. In another study, evidence was presented that suggests that another receptor is responsible for 20E events.

Through a mechanism that is not completely understood, investigators have reported that exposure to 20E induces a change in gene expression. It has also been reported that 20E secretion is positively correlated with Ca$^{2+}$ elevation. What is interesting about this process is that once this response is triggered these events are essentially synchronized synergistically to occur over time [1, 2]. These manifestations are in keeping with the traditional ligand-mediated responses in cell biology as ligands such as Ca$^{2+}$ must be first bound by binding proteins in order to cross the lipid bilayer.

It is known that when a cell is exposed to a steroid hormone there is an immediate change in the genes that are expressed into proteins. The elucidation of these genes would facilitate an understanding of how steroid hormones mediate physiological responses at the molecular level. In the salivary glands of larval D. melanogaster, pulses of 20E leads to a transcriptional cascade that facilitates the production of glue glycoprotein secretion towards the end of the last instar larvae (L3) during the pre-metamorphic pulse [1, 2]. The glue then serves as an adhesive that is responsible for enabling larvae to adhere to solid surfaces [1].

Approximately 2 h after 20E treatment, a massive increase in the concentration of Ca$^{2+}$ has been described in literature, suggesting that the Ca$^{2+}$ signal is required for secretion to occur [1]. After approximately 18 h in larval development after the pulse of 20E, the production of glue protein ceases [2]. The secretion of glue glycoprotein is a highly regulated process and has been shown to occur in concert with 20E secretion as it, during critical times in larval development, is emptied into the extracellular space by
means of vesicle-mediated exocytosis [2]. At this point, it is unclear regarding the link between the surge of calcium and glue secretion, and what proteins are responsible for mediation of these events.

METHODOLOGY

Based on RNAi silencing USP at 100 h in the salivary gland of D. melanogaster with transgenic USP RNAi, the functionality of USP in the heterodimeric complex to affect transcription can be assayed. The Gal4-UAS system contains transgenic animals possessing simple transcription factors (TF) coupled with respective enhancer elements (UAS-upstream activity sequence) making it possible to study gene expression—and hence its function. The Gal4-UAS system facilitates the production of GAL4 protein (yeast transcription activating protein that binds Pol II) only in salivary glands. Two important drivers used in our studies are hs-Gal4, which makes Gal4 in salivary glands from L1-L3, and Sqs-Gal4, which makes Gal4 only in salivary glands of L3.

Crosses were performed to procure a transgenic fly homologous for UAS-USP; First, we needed to produce a fly containing the USP-RNAi + USP+ construct (USP+T11). Such an animal could be made via transposase mutation via P-element mutation. The first desirable mutation involved a transgenic fly that possessed the following transgenes: the driver hs-GAL4, UAS-USP; constructs the block essentially preventing salivary gland synthesis of USP+, UAS-USP+ (the wildtype USP) to rescue synthesis, and finally glueRED serving as the reporter gene.

Mapping of the P-Element

Through the utilization of classical Mendelian genetics coupled with dominant marker-based selection, determination of the location of the P-element genically (w; P[w+, UAS-USP+] = genotype of transgenic line) was ascertained by performing crosses and recording the phenotypic ratios of the offspring. The figure below diagrams the crosses that were carried out closely outlining the location of the P-element (chromosome 2). The phenotypic ratios were then used to verify that the P-element was independently assorting for the markers on the other chromosomes confirming its location. Previous experiments conducted in our lab confirmed that the element was not located on the first chromosome.

**Cross 1:**

\[
\begin{align*}
\text{w; } & P[w^+, \text{ UAS-USP}]; + \times \text{ w; } \text{USP; (CA)} \\
\text{ w; } & P[w^+, \text{ UAS-USP}]; + \times \text{ w; } +; \text{ USP; (CA)} \\
\downarrow \\
\text{Cross 2:} & \\
\text{w; } & P[w^+, \text{ UAS-USP}]; \text{ USP; (CA)} \times \text{ w; } \text{Sco; MRKS} \\
\text{ + } & \text{ +} \\
\downarrow \\
\text{Cross 3:} & \\
\text{P[w', UAS-USP']}; \text{ USP; (CA)} \times \text{ P[w', UAS-USP']; USP; (CA)} \\
\text{Cyo} & \text{MRKS} \\
\downarrow \\
\text{USP}; \text{ USP} \\
\text{USP}; \text{ USP}
\end{align*}
\]

Fig.1 Schematic representation of genetic crosses to obtain the animal of interest using marker-based selection methodology. Cross 3 is still pending. Stocks were initially kept at 20 °C prior to crossing, then incubated at 25 °C after crossing for expedience.
Cyo (Cy), MRKS (Sb), and TM6B (Tb) were used as the primary genetic markers for selection purposes. If the P-element landed on the second chromosome, progeny will show segregation Cyo and independently assort with the markers on chromosome 3 resulting in red-eyed flies with MRKS, but no red-eyed flies with Cyo. If the P-element landed on the third chromosome, progeny will show segregation with TM6B and independently assort with the markers on chromosome 2 resulting in red-eyed flies with Cyo and no red-eyed flies with MRKS. If the P-element landing on the fourth chromosome, offspring with red-eyes will possess MRKS and Cyo phenotypes.

Transcriptome Analysis
Using the transcriptome of D. melanogaster, we were able to conduct an extensive search through the database of approximately 13,000 genes and find RNAs associated with proteins that exhibited significantly elevated levels of Ca2+ during the pre-metamorphic pulse in L3 larvae. To begin the analysis portion of this project, a preliminary screen of the transcriptome (mRNA database) of D. melanogaster was conducted in order to identify genes that are either upregulated or downregulated in a drosophila tissue after 20E steroid exposure. Next, the list that was generated was cross listed with genes known to be involved in Ca+ signaling.

RESULTS
During the genetic crosses, phenotypic ratios were skewed towards red-eyed progeny that possessed TM6B with no red-eyed flies containing the Cyo marker. This result supports the conclusion that the P-element is located on the second chromosome. Also, a compilation of 20 candidate genes was compiled. This is a list (not inclusive) of the genes that will be primary subjects for functional tests in live animals: CG11577, CG4877, CG13898, CG9236, LpR1, Ndg. All of these species were identified in the assay as being implicated genes in the Ca+ regulated response as they encode for proteins that possess Ca+ binding motifs.

CONCLUSION
Transcriptome analysis yielded proteins will be the subject for future studies as many of the calcium binding properties contained functional EF hand domains, which are helix-turn-helix motifs [5]. Further analysis will invariably be necessary to locate additional genes that may provide additional insight into the complete mechanism behind how 20E/Ca+ elevated events are mediated at the molecular level.

In regards to the generation of the animal possessing both homologous chromosomes for USP+, and USP-, provided that we now have knowledge concerning the specific location of the P-element in the genome of D. melanogaster the next step will be to perform additional crosses that would give targeted progeny with the GOI. It is hoped that the assay will provide information regarding whether USP-RNAi will construct the block of glue protein secretion, or whether USP+ will rescue salivary gland synthesis. At the completion of this project, the necessity of the USP domain in the synthesis/secretion of glue proteins in L3 larvae should become clear.

REFERENCES


ABSTRACT
Glycerol dialkyl glycerol tetraethers (GDGTs) are core membrane lipids of Archaea and Bacteria found ubiquitously in soils and in many aqueous environments. Here, we examined the GDGT concentration in forty sediment samples from the Great Basin (USA). Sediment samples were collected in tandem with extensive geochemical and site characterization. Hot spring temperatures ranged from 31 to 95°C and pH values from 6.8 to 10.7. Parametric Pearson's correlation coefficients and nonparametric Spearman's rho values were calculated to identify significant correlations between GDGT profiles and geochemical analytes. Isoprenoidal GDGTs (iGDGTs) negatively correlated with pH and positively correlated with temperature, Cr, and Cu; which is consistent with the importance of iGDGTs in the maintenance of membrane integrity at high temperature spring sources. In contrast, branched GDGTs (bGDGTs) displayed a negative relationship with temperature and a positive correlation with NO3-, NO2-, and dissolved oxygen, demonstrating a niche for bGDGT-producing organisms in cooler, more oxidized springs away from the hottest geothermal sources. In addition, a collection of eleven thermophilic bacterial strains hypothesized to synthesize bGDGTs were tested; however, none synthesized GDGTs under the tested conditions. Our data provides insight into the environmental conditions under which archaeal and bacterial GDGTs are produced, which may improve the use of GDGTs as environmental proxies for understanding climates and conditions of the past and the future.

INTRODUCTION
Glycerol dialkyl glycerol tetraethers (GDGTs) are core membrane lipids of Archaea and Bacteria
which occur ubiquitously in oceans, lakes, soils, peat bogs, and sediments (Zink et al. 2010, Schouten et al. 2007, Weijers et al. 2006b, Sinninghe Damsté et al. 2000). GDGTs have been used as biomarker proxies to improve and confirm estimates of paleoclimatic conditions. Accurate reconstructions of historic temperature change are essential elements of climate models that help predict environmental impacts and rates of future climate change (Zink et al. 2010). Analyses of most cultivated thermophilic archaea, including all known Crenarchaeota and Thaumarchaeota, showed that their membranes are composed of isoprenoid glycerol dialkyl glycerol tetraethers (iGDGTs) (Brochier-Armanet et al. 2008, Spang et al. 2010, Sinninghe Damsté et al. 2002, Schouten et al. 2002). Archaeal GDGTs are membrane-spanning lipids comprised of two isoprenoid chains joined with four ether bonds to two glycerol backbones (Weijers et al., 2006b). The structure of the archaeal tetraether membrane was first considered to be an adaptation to extreme environmental conditions, due to the covalent linkage between hydrophobic moieties, which is much more stable to thermal and chemical denaturation than other known membranes that lack the covalent linkage (Yang, Ding, Zhang, Wu, Ma, and He, et al., 2011, Sinninghe Damsté et al. 2002). A newly discovered group of tetraether membrane lipids, branched glycerol dialkyl glycerol tetraethers (bGDGTs) have been identified and found to be ubiquitous in peat bogs and soils (Weijers et al. 2009, Schouten et al. 2000, Sinninghe Damsté et al. 2000). The bGDGT profiles vary according to the degree of methylation of the alkyl chains and the number of cyclopentyl moieties (Sinninghe Damsté et al. 2000). Although the bGDGTs contain the membrane-spanning feature and ether linkages similar to lipids of the Archaea, the stereochemical configuration of the second carbon position of the glycerol backbone has only been found in the Bacteria; therefore, these compounds are proposed to have a bacterial rather than archaeal origin (Yang et al. 2011, Weijers et al. 2006a).

The bGDGTs are highly abundant in the water saturated part of peat bogs, suggesting that the bacteria producing these lipids are anaerobes (Weijers et al. 2006b). In contrast, studies documenting low concentrations of bGDGTs in other freshwater systems have led to speculation that bGDGTs are not produced in those environments, but introduced from surrounding soils (Zink et al. 2010, Sinninghe Damsté et al. 2009, Tierney and Russell, 2009). Similarly, Schouten et al. (2007) suggested that low concentrations of bGDGTs in terrestrial geothermal systems were of allochthonous origin. It remains unclear which bacteria are capable of producing bGDGTs and under what conditions.

Until now, few studies that have investigated the occurrence and distribution of GDGTs in hot spring environments (Pearson et al. 2004, Pearson et al. 2008, Zhang et al. 2004, Pitcher et al. 2009, Schouten et al. 2007). In this study, we determined the composition and abundance of isoprenoidal and branched GDGTs from geothermal springs in the Great Basin (USA) with temperatures ranging from 31 to 95°C and with pH values ranging from 6.8 to 10.7. An extensive geochemical characterization of water samples was completed in tandem with sediment sampling. The concentrations of iGDGTs and bGDGTs in sediment samples demonstrated an enrichment of iGDGTs in reduced, high temperature conditions.
spring sources. In contrast, bGDGTs were enriched in lower temperature,
more oxidized samples. Although we examined a variety of pure cultures of
thermophilic bacteria previously suggested to be possible biological
sources of bGDGTs, including Dictyoglomus, Thermus, Thermodesulfobacterium,
Caldicellulosiruptor, and novel Chloroflexi, none were shown to produce GdGTs.

METHODOLOGY
Sampling
Samples were collected from eight hot springs located in the U.S. Great Basin,
from northwest Nevada and northeast California (Figure 2). Prior to sampling,
the temperature, pH, and conductivity were determined at the precise
sampling location with a calibrated and temperature corrected probe (LaMotte 5
Series, Chestertown, MD or YSI Model pH350i, Weilheim, Germany). The sediment-
or mat-water interface (about 1-2 cm) was collected with sterilized spoons, homogenized in sterilized pie
tins, and transferred into four 50 mL Falcon tubes and ten 1.5 mL Eppendorf tubes. All samples were
frozen immediately after collection on dry ice and were transported on dry ice before being stored at
-80°C in the laboratory.

Water samples were collected for chemical analysis at each sampling location prior to sediment
sampling. Oxygen and sulfide were measured in the field using the HRDO Accuvac ampule method
(Hach) and the Pomeroy methylene blue method (Hach), with modifications for high temperature as
described (Miller-Coleman et al. 2012). Water samples for lab measurements were immediately
frozen and transported back to the lab where they were analyzed by ion chromatography (anions,
Dionex DX-500 chromatograph, AS14A column, with 10 μM Na2CO3/NaHCO3 as an eluent, Dionex,
USA) or by direct current plasma emission spectrometry (cations, DCP-OES, Beckman, USA).

NO3-, NO2-, and NH4+ were measured by automated colorimetry as described by Dodsworth
et al. 2012 (Lachat, USA).

Cultures
Eleven thermophilic bacterial strains hypothesized
to produce bGDGTs were grown in liquid media
for subsequent lipid analyses. Dictyoglomus
thermophilum and D. turdium were grown on DSMZ
388 medium at 70°C. Thermus oshimai and two
unidentified Thermus strains were grown
anaerobically under nitrate-reducing conditions on a
modified Castenholz medium D with 0.1% yeast
extract, 0.1% tryptone at 60°C. Methods for this
medium are discussed in Hedlund et al. (2011).
Thermodesulfobacterium commune was grown on DSMZ
206 medium at 70°C. Caldicellulosiruptor bescii, C.
krustjanseini, and C. obsidiansis were grown on ATCC
1698 medium at 70°C. Novel bacterial strains JKG1
and JKG2 were grown at 55°C on modified R2A
medium with 0.025% tryptone, 0.025% peptone,
0.05% casamino acids, 0.05% yeast extract, 0.05%
glucose, and 0.05% soluble starch according to the
methods described in Reasoner and Geldreich,
(1985). After growth in liquid media, samples were
centrifuged into pellets and frozen at -80°C.

Lipid Extraction
Hot spring sediment/mat samples and cell pellets
were freeze-dried before extraction to remove
excess liquid and powdered with a mortar and
pestle. Lipids were extracted quantitatively from an
initial mass of 5 grams of sediment/mat using a
modified Bligh-Dyer extraction method (Lengger
et al. 2012) that comprised of four cycles of
ultrasonication and centrifugation using methanol:
dichloromethane:phosphate buffer (2:1:0.8, v:v:v).
The supernatants were collected and the separation of the organic layer was achieved through the addition of 5 mL of dichloromethane (DCM) and 5 mL of deionized water (DIH2O). All extracts were evaporated under nitrogen. Dried lipids were dissolved in n-hexane: ethyl acetate (1:1, v:v) and MeOH as eluents to collect the nonpolar (F1) and polar (F2) fractions, respectively, via silica-gel column chromatography. After the collection of fractions, 30 μL of a GDGT C_{46} standard was added to all fractions. The polar fraction was divided into two parts (F2A, F2B). F2B was hydrolyzed with MeOH:HCl (95:5, v:v) and heated at 70°C for 3 hours. Afterwards, the organic layer was extracted with the addition of DIH2O and DCM. An additional 1 to 3 mL of DCM was added to F2B to collect the organic layer. F1, F2A and F2B extracts were all dried under nitrogen and dissolved in n-hexane:isopropyl alcohol (99:1, v:v) for analysis.

**Liquid Chromatography-Mass Spectrometry (LC-MS)**

All fractions were tested on an Agilent 1200 liquid chromatography equipped with an automatic injector coupled to QQQ 6460 MS and Mass Hunter LC-MS Manager software. Separation of peaks was achieved using a Prevail Cyano column (2.1 mm x 150 mm, 3 μm; Alltech, Deerifled, IL, USA) and maintained at a constant temperature of 40°C. The volume of injection was 5 μL. GDGTs were first eluted with 90% n-hexane and 10% isopropanol for 5 min, followed by a linear gradient to 18% isopropanol for 45 min. The solvent was kept for 10 min in 100% of isopropanol and allowed to equilibrate for 10 min. Detection of GDGTs was performed using Agilent 6460 triple-quadrupole mass spectrometer (APCI) ion source. Conditions for APCI/MS were: nebulizer pressure 40 psi, vaporizer temperature 350°C, drying gas (N2) at 5 L/min at 250°C, capillary voltage 5 kV, and corona 4 μA (Zhang et al., 2012).

**Statistical Analyses**

Parametric Pearson’s correlation coefficients and non-parametric Spearman’s rho values were calculated in SPSS at the 0.05 level of significance to identify correlative relationships between GDGT types and geochemical analytes.

**RESULTS**

**Geochemical Features Correlating with GDGT Abundance in Natural Sediments and Microbial Mats**

The Great Basin hot spring sites sampled had temperatures ranging from 31 to 95°C and pH values ranging from 6.8 to 10.7, including high temperature geothermal sources, cooler samples in outflow channels, and cooler spring sources. All sediment samples contained some amount of isoprenoidal and branched GDGTs, but in variable concentrations. iGDGTs negatively correlated with pH, F, and Cl and positively correlated with temperature, Cr, and Cu. In contrast, bGDGTs displayed a negative relationship with temperature and a positive correlation with NO_3^-, NO_2^-, and dissolved oxygen (Table 1).

**Table 1**: Selected Pearson’s parametric and Spearman’s non-parametric correlations between core and polar lipid types, focusing and statistically significant relationships.

<table>
<thead>
<tr>
<th>Type</th>
<th>Temp (°C)</th>
<th>pH</th>
<th>O (ppm)</th>
<th>C (ppm)</th>
<th>F (ppm)</th>
<th>Cl (ppm)</th>
<th>NO_3^- (ppm)</th>
<th>NO_2^- (ppm)</th>
<th>Dissolved Oxygen (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDGT</td>
<td>&lt;0.05</td>
<td>0.29</td>
<td>0.84**</td>
<td>0.84**</td>
<td>0.84**</td>
<td>0.84**</td>
<td>0.84**</td>
<td>0.84**</td>
<td>0.84**</td>
</tr>
<tr>
<td>F1+i</td>
<td>≥0.4</td>
<td>≤-0.4</td>
<td>≤-0.4</td>
<td>≤-0.4</td>
<td>≤-0.4</td>
<td>≤-0.4</td>
<td>≤-0.4</td>
<td>≤-0.4</td>
<td>≤-0.4</td>
</tr>
<tr>
<td>F2</td>
<td>≤0.4</td>
<td>&gt;0.4</td>
<td>&gt;0.4</td>
<td>&gt;0.4</td>
<td>&gt;0.4</td>
<td>&gt;0.4</td>
<td>&gt;0.4</td>
<td>&gt;0.4</td>
<td>&gt;0.4</td>
</tr>
<tr>
<td>F2B</td>
<td>≤0.4</td>
<td>&gt;0.4</td>
<td>&gt;0.4</td>
<td>&gt;0.4</td>
<td>&gt;0.4</td>
<td>&gt;0.4</td>
<td>&gt;0.4</td>
<td>&gt;0.4</td>
<td>&gt;0.4</td>
</tr>
</tbody>
</table>

* Weakly significant relationships (p>0.05).
** Statistically significant relationships. Pink, positive relationships (r ≥ 0.4, p<0.05). Blue, negative relationships (r ≤ -0.4, p<0.05).
Search for GDGTs in Membrane Lipids of Selected Microbial Isolates

A variety of thermophilic bacteria previously suggested being possible biological sources of bGDGTs were grown in pure culture under standard conditions at or near established growth optima and extracted lipids were analyzed for GDGTs, including Dictyoglomus, Thermus, Thermodesulfbacterium, Caldicellulosiruptor, and novel Chloroflexi. However, none were shown to produce GDGTs under the tested growth conditions.

DISCUSSION

To date, this study is the most detailed biogeochemical survey investigating the distribution of GDGTs in hot spring environments. This work builds upon the study of Pearson et al. (2008), which examined GDGT profiles from pure cultures of Crenarchaeota and the distribution of GDGTs in geothermal hot springs, including Yellowstone National Park (USA), the Great Basin (USA), Kamchatka (Russia), Tengchong (China) and Thailand. This current data set reveals new relationships between an extensive suite of geochemical analytes and GDGTs from highly variable hot spring sediments in the U.S. Great Basin.

Isoprenoidal GDGTs in hot spring sediments

Our data indicates unexpected relationships between iGDGTs from hot spring sediments and pH of hot spring water. In a study by Pearson et al. (2008), crenarchaeol (GDGT-5) had a positive correlation with pH, but a negative correlation with GDGT-4. Our data further confirms the negative relationship between GDGT-4 and pH, but our parametric correlation analyses also revealed a negative relationship between pH and crenarchaeol. These contradictory findings may be the result of a narrow pH range examined in these studies. In comparison, the study by Pearson et al. (2008) included a wide pH range from 3.0 to 9.2, whereas this study focused on a neutral to alkaline pH of 6.8 to 10.7. Springs in this pH range are buffered to some degree by the bicarbonate buffering system, which increases pH along spring outflow systems due to CO2 degassing and consumption; thus, the negative relationship between iGDGTs and pH described here is likely due to co-variation of pH and temperature. In a study of GDGT composition of a hyperthermophilic crenarchaeon Acidilobus sulfurireducens, the average amount of rings per GDGT was negatively correlated with pH (Boyd et al. 2011). In a similar study of Yellowstone National Park hot springs, microbial mats revealed that crenarchaeol did not correlate well with pH (Schouten et al. 2007).

Similar to some previous studies, iGDGTs from hot spring sediment samples were strongly tied to water temperature. In this study the total amount of core and polar iGDGTs had a positive relationship with temperature. Pearson et al. (2008) reported a positive relationship between temperature and the amount of rings per GDGT type. Yet, according to Pearson et al. (2004), there was no apparent correlation between total iGDGTs and temperature. Schouten et al. (2007) found a low abundance of crenarchaeol and no correlation with temperature. The varying results from these studies suggest that other physical or chemical parameters in addition to temperature may influence the GDGT composition.

Our results show previously unrecognized positive correlations between iGDGTs with Cr and Cu and negative relationships between iGDGTs with F and Cl. A study by Miller-Coleman et al. (2012) modeled the complex geochemistry of several Great Basin hot springs. Results from their non-metric multidimensional scaling showed Cl varied within the Great Boiling Springs area and was elevated in the subset of GBS springs that are deeply sourced and high temperature relative to other Great Basin springs. In addition, the concentrations of F and Cu co-varied with pH throughout these various springs. Acidity-driven solubilities of metal ions have been well-documented (Dyer et al. 1998), and influenced geochemical relationships found in this dataset. Overall, these observations suggest that some underlying patterns and geochemistry may correspond to bGDGT distribution, and that these correlative ions may not necessary control the production of these lipids.

Branched GDGTs in hot spring sediments

While several studies have investigated relationships between iGDGTs and environmental factors, this study is one of the first to examine the relationship of bGDGT production to physiochemical conditions. The total amount of bGDGTs showed a weak statistically significant relationship to pH, but Spearman’s nonparametric
analyses showed a strong positive correlation between branched polar GDGT Ib and pH (rho=0.475, sig = 0.001). Studies have shown that the relative amount of cyclopentyl moieties, expressed in cyclization ratio of branched tetraethers (CBT), is primarily related to soil pH and not temperature. The relative amount of methyl branches, expressed in methylation index of branched tetraethers (MBT), positively correlates with the annual mean annual air temperature (MAAT) and negatively correlates with soil pH (Weijers et al. 2006a). The relative distribution of bGDGTs containing cyclopentane rings is thought to be determined by pH (i.e., with increasing pH, the bGDGT distribution decreases) (Weijers et al. 2007).

This study identifies new relationships between bGDGTs and temperature. Previous studies have shown absent or weak correlations between the relative abundance of bGDGTs and temperature (Weijers et al. 2006, Schouten et al. 2007, Pearson et al. 2004). In contrast, our Spearman’s nonparametric correlations showed the total amount of polar bGDGTs were negatively related to temperature. We speculate there may be an upper temperature limit to the production of bGDGTs or for the bGDGT-producers.

Our results are the first to show a positive relationship between bGDGTs and NO3- and NO2-. The cause of this relationship has not been fully explored, but this pattern could indicate a number of phenomena. The organism(s) producing these orphan lipids might utilize or produce NO3- and/or NO2- during metabolism. bGDGT-producing organisms may instead share a mutualistic relationship with microorganisms within the hot spring environment that use or produce NO3- or NO2- during metabolism. bGDGT-producing organisms may only be produced by the tested strains under specific environmental and physiochemical conditions that we were unable to replicate in the laboratory environment. In the future, alternative extraction methods could be utilized to ensure that no bGDGTs were present in these cultures.

**CONCLUSIONS**

Analyses of hot spring sediments revealed an abundance of glycerol dialkyl glycerol tetraethers (GDGTs) under a variety of environmental conditions. Statistical analyses revealed negative correlations between iGDGTs and pH, F and Cl and positive correlations between iGDGTs and Cr, Cu, and temperature. In contrast, bGDGTs had a weak, positive correlation with pH, but a strong, positive relationship with NO3- and NO2-, and had a negative correlation with temperature. These results elucidate the use of GDGTs as environmental proxies (Hopmans et al. 2004) which allows us to understand our climatic past and assist in predicting future rates of paleoclimate change. Further data analyses are still in progress. Future analyses include calculating the environmental proxies of cyclization of branched tetraethers (CBT), methylation index of branched tetraethers (MBT) and branched and isoprenoid tetraether (BIT). Other analyses will also compare the GDGT composition between surrounding soils and hot spring sediments to differentiate if GDGTs from geothermal systems are of autochthonous or allochthonous origin. Pyrotag sequencing of these sediment samples will also provide insight into the organisms that potentially produce these bGDGT lipids.

**REFERENCES**


AN AMERICAN MESS: HOW COLORBLIND RACISM PREVENTS AN ENLIGHTENED CONVERSATION ON RACE IN TELEVISION MEDIA

BY NATHANIEL DEREK PHILLIPPS

ABSTRACT
Race is one of the most, if not the most, significant factors of our identity. It shapes our ideas on sexuality, gender, power, success, love, religion, our ideals, our hopes and our dreams. We are all racial beings, and the media is inherently interested in portrayals of race in American society. The purpose of this study is to examine how race is constructed through selected contemporary television programs and to analyze the racial ideology they deliver. In this paper, non-white racial and ethnic groups will be referred to the broad term as "people/person of color" as the term minority has been rejected in many spheres as connoting inferiority. People of color (POC), at least in contemporary usage, is an umbrella term that links together the Black, Latino/a, Asian and Pacific Islander (API), and Native American communities. POC is a descriptor that these groups created as a means of self-naming (as opposed to the imbalanced power dynamic of "minorities") and empowerment, and unlike the case with "minorities," recognizes that this power dynamic was institutionally created and is institutionally maintained. Since it is understood the media delivers ideology, both implicitly and explicitly, it is critical to examine that ideology for what it perpetuates about social norms and what is deemed acceptable or not in our country. This project is important in that it examines media content to identify aspects of its racial ideology, and then aims to see how these aspects in particular shows conforms or not to the dominant racial ideology in the United States. A large amount of research has previously been conducted on race in the media; much of it focusing on news and print media. And there has been substantial analysis of representation (which includes underrepresentation, misrepresentation, and invisibilization) and stereotypes of POC characters in television and movies. However, continuous research is necessary because racial representation is in a constant state of flux as racial dynamics in our country shift and change over time.

INTRODUCTION
Puerto Rican born, Duke University professor of sociology, Eduardo Bonilla-Silva, contends that the dominant racial ideology of the post-Civil rights era
is that of “color blindness.” In his book *Racism without Racists*, Bonilla-Silva states that:

Whereas Jim Crow racism, explained blacks’ [and other minorities] social standing as the result of their biological and moral inferiority, color-blind racism avoids such facile arguments. Instead, whites rationalize minorities’ contemporary status as the product of market dynamics, naturally occurring phenomena, and blacks’ [and other minorities] imputed cultural limitations.... In contrast to the Jim Crow era, where racial inequality was enforced through overt means... today racial practices operate in “now you see it, now you don’t” fashion. (2010:2-3)

Bonilla-Silva’s arguments are based on previous research, along with two primary sources. The first is the 1997 Survey of Social Attitudes of College Students, based on a sample of 627 college students (451 whites) surveyed at a large midwestern university, a large southern university, and a medium-sized west coast university. Ninety percent of the respondents left contact information on the survey, and 10% of these were randomly chosen to participate in interviews, including: 17 men, 24 women, 31 individuals from middle- and upper-middle class backgrounds and 10 from a working class background. The second primary data source is the 1998 Detroit Area Study (DAS). This data set included 400 Black and white Detroit metropolitan area residents (323 whites and 67 Blacks). From that group, 84 respondents were randomly selected for in-depth interviews (66 whites and 17 Blacks). The author defends criticism of a lack of validity for this data, due to it being somewhat outdated, by responding that “both survey research as well as interview based research (e.g., Bush 2004; Gallagher 2002; etc.) done since have produced similar results, thus adding strength to my arguments in this book” (Bonilla-Silva 2010).

Bonilla-Silva (2010) contends that the significance of highlighting the current dominant racial ideology is that “color-blind racism serves today as the ideological armor for a covert and institutionalized system in the post-Civil Rights era. The beauty of this new ideology is that it aids in the maintenance of white privilege without fanfare, without naming those who it subjects and those who it rewards” (p. 13-14). The ideology relies on four central frames to advance its message. The first is that of abstract realism, or employing the idea that public policy should not be used to achieve social parity among racial groups, and that economic liberalism (e.g., choice, individualism) used in an abstract manner justifies racial disparities (Bonilla-Silva 2010). The second frame is naturalization wherein whites present racial phenomenon as natural occurrences, in essence de-racializing disparities (Bonilla-Silva, 2010). Cultural racism is using culturally based arguments such as “Blacks don’t work hard enough” or “Asians are smarter” to explain minorities’ status in society (Bonilla-Silva, 2010). Lastly, arguing that racism no longer applies to the life chances of
people of color, and that racial disparities no longer exist is the frame of minimization (Bonilla-Silva, 2010).

In The Black Image in the White Mind: Media and Race in America, Robert Entman and Andrew Rojecki (2000) describe how racial constructions of Black Americans are built and disseminated by mainstream media institutions (which primarily employ whites) and produce a comprehensive overview of how these constructions filter through the minds of white Americans. The authors focus on different media, such as print, television news media, sitcoms and dramas, and film. An overarching emphasis of the work is on how images are mediated; both what is and what isn’t seen on the screen come together to shape viewers’ conceptions on race (and others ideas). For the authors, this is critical for media analysis.

All ethnic minorities in the United States suffer from similar problematic representations of their community in American media, which is the focus of Stephanie Greco Larson’s (2005) Media & Minorities: The Politics of Race in News and Entertainment. Larson filters through decades of film and television media writing in detail about how each minority community has been and is represented. Her work provides readers with specific accounts of stereotypes, archetypes, etc. She also emphasizes the selectivity and exclusivity of mainstream media, regarding which specific roles have over time been permitted to POC and which have not.

Frances Henry and Carol Tator’s (2000) article, “Racist Discourse in Canada’s English Print Media,” contains an extensive investigation into Canadian print media to reveal direct and substantial evidence for institutional bias, slanting, and racist discourse directed towards minority ethnic groups in Canadian society. The article provides several theoretical frameworks for analyzing media content, explains ideology and how the media often advances a particular racial ideology ideology, and then lists specific examples of how this ideology is portrayed in print media.

With countless examples of problematic representations of race in contemporary media, it is enlightening to come across media content that provides a promising take on how this institution can be used for progressive ends. Floris Muller (2009), in “Entertaining Anti-Racism: Multicultural Television Drama, Identification and Perceptions of Ethnic Threat,” demonstrates how media can be intentionally constructed to support an anti-racist ideology. This is an ideology that can be described in terms of its ability to show characters of diverse identities interacting together to a substantial degree, and when faced with inter-group conflict, work in constructive ways to overcome the tension. Drawing on social identity theory and social learning theory, Muller shows how specifically constructed anti-racist media content can teach audiences behaviors and strategies to better confront racial barriers between different groups in real life.

**METHODOLOGY**

The methodology for this project is a thematic qualitative content analysis of two television shows of different formats. The selected shows are as follows:

<table>
<thead>
<tr>
<th>Show</th>
<th>Network</th>
<th>Season(s)</th>
<th>Episodes</th>
<th>Running Time</th>
<th>Genre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scandal</td>
<td>ABC</td>
<td>1</td>
<td>7</td>
<td>43 min (approx.)</td>
<td>Political Thriller</td>
</tr>
<tr>
<td>The Walking Dead</td>
<td>AMC</td>
<td>2</td>
<td>19</td>
<td>45 min (approx.)</td>
<td>Post-apocalyptic Serial</td>
</tr>
</tbody>
</table>

Analysis will be drawn from the first complete season of each series: 7 episodes of Scandal and 6 episodes of The Walking Dead. The primary research questions are:

1. How are POC characters represented in mainstream, contemporary American television shows?
2. Do mainstream contemporary American television shows adhere to a colorblind ideology as defined by Bonilla-Silva?

Each individual episode is examined for the following characteristics: the presence or absence of POC characters; the types of roles they occupy (if present); the nature of race/ethnicity in each episode plot (central, marginal, absent); and the nature and extent of dialogue about race/ethnicity in each episode.

With this methodology, the researcher first sifted through the media to identify the presence or absence of racial representation. The researcher coded each episode to denote representation of
race through dialogue, plot, and characters. Third, the researcher constructed categories for the style of the representation, which include: colorblind, direct, neutral, stereotypical, non-representative, and progressive portrayals. This coding mechanism aided in simplifying quantifying the amount of racial representation in a particular episode, season, or entire series, and qualitatively correlating it to the ways it represents race, both positively and negatively.

The primary limitations of this study are the relatively small size of the sample and its basis on convenience. Considerations for further research include a larger and more representative sample, comprised of the most popular television shows.

DATA ANALYSIS
In this section, the instances of racial representation were recorded that were shown or not shown in both programs, in simple quantitative fashion. In the following paragraphs, the specific racial constructions portrayed in each show were discussed. Even if a show has no instances of dialogue or plot focused on race, it may still be worthy of analysis, especially if there are POC characters.

In the first season of Scandal there are three main characters who are POC. However, there were zero (0) instances of plot or dialogue that portrayed race in any way. Race is not just marginal to this show; it is invisible, save for the characters’ skin color. Regarding the first research question, concerning how POC characters are represented, the answer can only be that they are “non-representative.” Race is not a factor in any aspect of their lives, and their racial identities may as well not exist. This non-representation means that Scandal strictly adheres to a colorblind ideology. The roles could have been played by any actor or actress because race is a non-factor. Further analysis to support my conclusion is found below.

The Walking Dead features more nuanced representation. The cast is more diverse and includes numerous POC characters both with and without speaking roles. There were seven (7) instances of dialogue regarding race, and each of these were classified as containing “directly” racist comments. Two (2) instances of plot were classified as direct. Besides the character T-Dog having a stereotypical name, the four main recurring POC characters in the first season are progressive. They do not rely on stereotypes. They are central to the plot to varying degrees. Regarding plot construction of race, two episodes in particular were constructed in such a manner that they put forward a racial ideology, and both of these constructions are problematic and regressive. Overall, The Walking Dead cannot be viewed as adhering to a colorblind ideology. Based on the analysis, the researcher posits that the ideology is more direct, relying on racist epithets, jokes and slurs, and well as problematic and regressive constructions, including upholding white supremacy and otherizing POC.

SCANDAL
Scandal is a political thriller set in Washington D.C. that focuses on the crisis management firm Olivia Pope and Associates. The leading character, Olivia Pope, is based on former White House Press Secretary Judy Smith, a Black woman. Scandal can be considered a show that is targeted towards a white audience because Olivia Pope's clients are mostly white, with tremendous power, prestige, influence, and wealth. Because of Olivia's stature as a previous White House aid and close friend of the current president and his wife, her services would only be known to the national elite. In the first episode, Olivia has to solve a major crisis ensuing from allegations that a rising star and popular face of the Republican Party—war hero Sully St. James—has murdered his own girlfriend. The startling revelation and his alleged alibi is that he is gay and was with his lover at the time of the killing. Ultimately he reveals his sexuality first to himself and then the nation to absolve him of the crime.

In her own words, Olivia never gives up at solving the problems of the Washington elite—who are rich, white, and powerful—even when they may not be the most upstanding of citizens. Olivia doesn't discern morality from any of her clients; she just does her job, with a blind passion that is never explained. Everyone knows the she can handle their problems, and they trust her to do so. It is unclear what drives Olivia and anything about her as a person. She gives both solicited advice (as part of her role as the crisis manager) and unsolicited advice (because her clients expect her too), and they are taken as truth. In certain respects, Olivia Pope could be seen as a modern day "mammie" figure. In Media and Minorities, Stephanie Larson (2005) describes a mammie as "an unattractive, large,
desexualized woman who lived to serve... She was beloved, long suffering, and faithful and derived her identity from serving white people” (p. 26). Even though Olivia Pope could never be characterized as unattractive, large, or desexualized, she absolutely can be seen as beloved, long suffering (because of the heartache she experiences in regards to her tumultuous relationship with the President), faithful and deriving her identity from serving white people, as detailed in earlier paragraphs. But, alas, in this world of Washington elites, she can still be silenced and reminded of her place - especially by a wealthy patriarchal (rapist) man who rejects her Mammy advice. She tries to overcome patriarchal dominion, but she collapses into its spell, sacrificing her own integrity--at least for the first few episodes --as she is tormented by her feelings for the [white] President.

Scandal is progressive in the sense that it stars several POC characters. But beneath the surface, this show is a poster for colorblind or post-racial hubris. Regardless of the fact that their colleagues and clients are predominantly people that don't look like them, race is not salient in the lives of Olivia and her two other associates who are Black and Latino. This can be explained through “prototype theory” as explained in Black Image in the White Mind. Black characters that are included in primetime television drama can avoid the reductiveness of their character to negative stereotypes only if they “renounce virtually all symbolic traces of Blackness and embody those characteristics associated with White virtue” (Entman and Rojecki, 200, p. 155). The characterization of Olivia and others as race-less follows what Larson (2005) says about selective exclusion of Blacks in entertainment media, that “Black communities and characters with black cultural identities are missing in film and television” (p. 24).

This show is scripted well to the established norm regarding POC characters as being incomplete. These characters don’t have families, partners, or lives outside of their work, “unique characterization[s] that would make them more developed and understandable. Black characters are usually shown in the context of their relationships with whites rather than with each other” (Larson 2005, p. 25). Although it is understandable that the show would primarily center around the professional relationships of the main character, there are still limiting trends to observe. This dynamic (besides failing to purport with reality) binds them to a very strict and formal relationship with other characters on the show, and they are not able to form bonds of friendship, or have personally nuanced conversations or character development.

Entman and Rojecki write that “Strict role-governed behavior raises a barrier to interracial personal involvement” (2000, p. 152). Olivia Pope’s life is shrouded in mystery, except for the fact that she was the target of the current Presidents affair during his campaign. Apparently, the only personal detail we can know or should care about is solely linked to a White man, supporting the framework of Black female sexuality being fully accessible to that class of character. Emily Nussbaum from The New Yorker sullenly writes that “The more people praise her, the more exceptional she becomes—and the less human (2012).”

Scandal fits Bonilla-Silva’s theory of color blindness because that ideology is the only way for the show to be successful. It is so popular because race is virtually absent. Nothing is ever made of the fact that three of the main characters are people of color, two Black, one Latino. But yet, that is significant, and it is exceptionally significant that Olivia is the first character like herself (Black and female) in a leading role to be renewed beyond one pilot season in 38 years (Dodai 2012).

By stripping Olivia of her identity, personality, or strength that comes from being a POC, the character is made tolerable so she then can be liked by a large mainstream swath of viewers, particularly females 18-49. The reasons we admire and like Olivia--her tenacity, her gut, the fact that everyone respects or fears her, her resolve--cannot co-exist with her blackness so that quality is hidden. Post-racialism describes the world that a colorblind ideology endeavors to create. But that is the thing about ideologies; they are beliefs, lenses for viewing the world. They can fail to realistically portray that world. The reality of this world is that so many outcomes are unfortunately dependent on race for millions of people in this country. Olivia Pope’s character in Scandal fits a theme of assimilation that reinforces a color-blind America and deny systems of inequality, because:

Blacks who are hard-working and stay within
The system can serve as evidence of a successful, color-blind society... The system works by rewarding hard-working, law-abiding Blacks, just as it does by rewarding hard-working, law-abiding whites. On one hand, we can think of these images...as progressive... On the other hand, they still privilege white culture by presenting a certain picture of what acceptable and successful blacks should be like (Larson 2006:34-35). Colorblindness has taught its students well.

The Walking Dead

Based on the comic book series of the same name, The Walking Dead captures the ongoing human drama following a zombie apocalypse. The show tells the story of a small group of survivors. The plot is focused primarily on the dilemmas the group faces as they struggle to balance their humanity with their need for survival against the zombie horde, (known as Walkers) while facing the changing dynamics of their group, and hostility from the scattered remains of a struggling human populace who are focused on their own survival now that the structures of society have collapsed.

The setting of the first season is primarily the city of Atlanta, Georgia, and a camp site miles outside the city.

In an almost too visceral scene in the first episode, while sniping Walkers (zombies) from a safe zone high above a building, a conflict ensues when a white male character named Merle calls a Latino man a “taco bender;” then says he would “never take orders from a nigger,” to T-Dog, a Black male character. Merle then brutally attacks and beats T-Dog, while the others are too frightened or not powerful enough to subdue him. While towering over T-Dog, after spitting on him and removing the gun from point-blank range of his face, Merle declares “We’re gonna have ourselves a little pow-wow. Talk bout who’s in charge. I vote me. Democracy time y’all. All in favor?”

Even in this new society, patriarchy and white supremacy are blazingly at play. All the other characters in this scene (three of whom are POC, one white woman) bow before Merle and his superiority. Rick, a main character who was a sheriff before Walkers overtook society, resists Merle and bashes Merle’s head with a rifle before handcuffing him to some pipes. As Merle struggles in the cuffs, Rick crouches over to notify him that, “There are no niggers or white trash crackers here. There’s us, and the dead.” Promising words, but the events and structure of later episodes of the show will suggest that there is short stock in his admonishment. Although the sheriff’s comment might at first suggest a progressive slant because he is rebuking Merle for using an offensive racial slur, it still is a “direct” representation because he nonetheless relies on the frames of blatant or overt racism by choosing to employ the word “nigger” for it to be neutral, or even progressive, he should have rebuked Merle with different language, not relying on the same racist frame as the offender. This contradiction of trying to do better when it comes to racial representation, but utilizing stereotypical or regressive elements to do so, is a feature seen throughout the first season.

While talking about the fact that Merle’s brother Daryl has not yet been made aware that Merle is handcuffed to a rail on a roof in Atlanta completely alone, the Korean character Glenn offers the advice to the group that, “I hate to bring race into this, but it might sound better coming from a white guy,” (instead of T-Dog). This dialogue suggests that POC cannot or should not talk about race and that whites still have to frame racial discussions. Does he say this to mean that white is neutral? Why can’t the bad news come from the Korean character’s mouth, or the Latino character’s mouth? The audience is supposed to make their own deductions about this consideration. Many will think nothing of it, while they are being fed the reinforcement of white neutrality or undue deference to Whites to frame racial discourse.

In The Walking Dead, white supremacy is legitimized and masked behind other considerations like the “elastic wall” of colorblind racism where whites find layered and nuanced ways of defending the racial status quo by combining different frames. Bonilla-Silva (2010) states that

Together these frames [abstract liberalism, naturalization, cultural racism, and minimization] form an impregnable yet elastic wall that barricades whites from the United States’ racial reality... Color-blind racism’s frames are pliable because they do not rely on absolutes...Instead color-blind racism gives some room for exceptions...and allows for a
variety of holding on to the frames—from crude and straightforward to gentle and indirect (p. 48)

The protagonists of the group defend the plan to rescue Merle (the racist) in different ways—needing the gun bag that Rick had to abandon in the city, needing the walkie-talkie in the gun bag, etc. These are compelling reasons, but the narrative structure of this episode is constructed in such a manner that these justifications are secondary. Understanding that danger is imminent and the probability of sustaining casualties is significantly increased at the base camp and also for those who attempt the search and rescue mission, all it takes is one person to die to negate the rationality of this risky maneuver. This episode might save face if the driving motivation for returning to the city were the secondary justifications, instead of being for the purpose of saving Merle. Is it worth risking the lives of everyone in the group in order to rescue an unabashedly racist and manipulative blowhard who will most likely subvert and betray the group’s safety in the future? Score one for white supremacy, but also, and as frustrating as it is to concede, for the struggle to maintain a sense of humanity in the midst of chaos and disorder.

In episode four, titled “Vatos”—meaning “man” or “dude”—the protagonists encounter a gang of Latino men while in Atlanta. They happen upon the gang because after Rick the others recover the bag of guns, the gang tries to rob them of the supplies. In this sequence, Glenn is kidnapped by the gang, and concurrently, one of the gang members is taken hostage by the protagonists later to be exchanged for their comrade. This episode is problematic, which is unfortunate because much racial representation is found here. All the gangsters are men of color, and they switch between speaking in English as well as Spanish. The title of the episode is a Spanish word, and Spanish is used throughout the episode.

The two opposing groups in this episode almost have a shootout over who gets to keep the bag of guns and ammunition, and whether or not the protagonists can rescue Glenn. It is later revealed, however, that their ‘gang’ behavior is actually a facade. The members of the gang are actually altruistic characters caring for the city’s surviving elderly. The elders have taken refuge together with the younger men, who have taken on the responsibility of protecting them. At first the gang is presented in stark contrast to the main white character as a nuisance he must confront. Why is this necessary? For the sake of drama? It makes the other POC characters seem irrational and prone to violence even when they share common interests of survival and protecting those that they care about.

Two POC were still alive at the season’s close, and these characters were mainstays throughout the season, which is promising. However, problematic elements (as in the case of POC characters in Scandal) hamper their progressive representation: they don’t have families, they don’t have other characters from their respective communities to associate with (Black and Korean), and it seems like they fill the diversity quota as everyone before them was either killed off, or written to make decisions that resulted in a terribly low likelihood for survival, or absolute certainty of imminent cremation.

At the end of the first season, I am not sure exactly what type of vision for society this show is extolling. Is it one of racial equity (if that is even important)? Gender equity? Compassion even in times of crises? Coming together with your fellow humankind to persevere through daunting obstacles? Maybe it is impossible to say for sure what an audience should gleam from this show, since we are given conflicting and contradicting messages at every turn. There are POC characters, but in the end, the show really is not about them, and the amount of dialogue for these characters shows that to be true. Commentators have written about how the show is expected to increase POC representation in the next season, so further analysis is necessary to see how well that is done.

CONCLUSION
Americans of all identities who view mainstream media are taught to maintain a worldview that values white people over people of color, or to disregard other identity groups completely. Colorblind ideology is so insidiously at play in the media. Inaction is an action, indecision is decision. Not casting POC in substantive roles or not dealing with race in meaningful ways (only using race for humor) are artistic/editorial directions. Even when made by accident, they work to demonstrate how colorblind ideology has destroyed any modicum of seriously addressing issues concerning race/
ethnicity in America, working to prevent racial parity and suggesting that we live in a society where race isn’t salient in peoples’ lives (except under the guise of humor).

In Racism without Racists, Bonilla-Silva (2010) writes that:

because whites experience even higher levels of social and spatial isolation that blacks, the “racial problems” related to their “confinement in the prison built by racism” must be as consequential as those produced by Black and Latino ghettoization. Therefore, ... high levels of social and spatial segregation and isolation from minorities create what I label as a “white habitus,” a racialized, uninterrupted socialization process that conditions and creates whites’ racial taste, perceptions, feelings, and emotions and their views on racial matters. (p. 104)

The strength of colorblind ideology, derives not from what is overtly said about race and about “others” in society. Colorblind racism is strong in that it allows the nurturing of racist ideas, conceptions, stereotypes, and beliefs because the hegemonic ideology is not directly critiquing, silencing, or refusing these problematic messages. It is the bystander effect, like witnessing a robbery taking place, in the park during an afternoon stroll for instance, and not stopping to come to the victim’s aid or even to call the police. Can we be mad at bystanders who do nothing when they see this terrible scene occurring? They are not the ones committing the crime. They have nothing to do with it, so one might argue. In essence, we are bystanders, or passive accomplices, with the media that we follow, support, and believe in, and that systematically undervalues or excludes POC. We reinforce and promulgate colorblind racism in our own homes each time we turn on a TV show or a movie in which people of color are not reflected in and choose not to change the channel, or press the power button.

REFERENCES


ABSTRACT
It is widely known and accepted that the cause of many mutations in cells are generated during DNA replication of actively dividing cells, however more recent research has shown that mutations also arise in non-growing conditions. This phenomenon is called stationary phase mutagenesis. Much of what is known comes from studies in eukaryotic and bacterial models. It has been proposed that in non-growing cells, the process of transcription plays an important role in mutagenesis. The hypothesis that DNA secondary structures was tested, formed during transcription, promote mutagenesis. The transcription-generated structures are speculated to be prone to mutagenesis by blocking the RNA polymerase which has potential to trigger a gratuitous response from transcription coupled repair proteins like MFD. Genes up-regulated in response to stress with secondary structures can accumulate mutations due to this gratuitous repair. To test this hypothesis, two Bacillus subtilis genes, argF and thiF, were used to predict in silico, and to form secondary structures. By altering the base sequence of these genes, the stability of their stem-loop structures are affected, thereby allowing us to test whether transcription of the altered sequence influences the accumulation of mutations in argF and thiF by impeding the RNA polymerase. Our assay for detecting mutations is based on phenotypic reversion back to prototrophy in cells under conditions of starvation. Ultimately, these experiments will increase our understanding of how mutations occur in cells of all domains of life.

INTRODUCTION
Here we investigate the role that stem-loop structures have in the generation of mutations during stationary phase in B. subtilis. Antibiotic resistance is a growing problem in the medical field; bacteria always seem one step ahead of scientists, able to inhabit inhospitable environments including our own bodies. What allows them to continue to adapt to both artificially created and natural environments are mechanisms that allow for the production of novel mutations that are then shared through conjugation, transduction, or transformation.
Most mutations have been attributed in the past to mistakes made by the replication machinery in the cell. Today new light has been shed on the role transcription can play on mutagenesis. Recent evidence in *Bacillus subtilis* and *E. coli*, suggests transcription as a driving force promoting mutagenesis and evolution in bacteria undergoing stationary phase, or non-growing stressful conditions. Under stress cells preferentially transcribe certain genes and repress others. Then, a mutagenic process biased towards expressed genes is more likely to produce beneficial mutations than genome-wide mutagenesis. This work is expected to help elucidate the mechanism underlying transcription-associated mutagenesis by testing the role secondary structures have on mutations.

**LITERATURE REVIEW**

**Background**

The generation of mutations is a subject that has generated much interest through the years with both the general public and the scientific community. The general public is concerned with mutations because they see their effects in the form of diseases and multidrug resistance bugs. Scientists are concerned with how mutations are formed because the understanding of such processes may lead to control and prevent disease development.

Even before the discovery of the structure of DNA made in 1953 by Francis and Crick, scientists began making conclusions about the generation of mutations in prokaryotes like *E. coli*. The biggest breakthrough for prokaryotic genetics came in 1943 when Luria and Delbruck showed not only did bacteria have genes and were suitable organisms for genetic research, but that their genes acquired mutations at similar rates to those found in eukaryotic systems. Luria and Delbruck (1943) were able to gain this important insight through their now famous fluctuation tests. Before their famous experiment the question of how bacteria adapted so quickly to their environment, particularly conditions in which a lethal selection (resistance to antibiotics or viral infection in bacteria) is applied to a cell population, was a mystery attempted to be explained by non-medelian genetics. Luria and Delbruck (1943) showed that mutations were random and disproved the notion that selective pressure induced mutations. Other scientists of the time began looking closer at the generation of mutations and many like Newcombe (1952) began to conclude that “gene changes might be limited to the period of duplication,” referred to as exponential phase for bacteria. This early work provided a mechanism foundation for many new studies, which were based on the assumption that all mutations were the source of errors made during replication or what Newcombe (1952) called a “metabolic active phase”.

The concept of stationary phase mutagenesis was revisited in the late 80s despite earlier observations suggesting that mutations may accumulate in conditions of non-lethal stress. The laboratory of Francis Ryan evidenced mutagenesis occurring in starving or non-dividing cells in the 50s. However, this research subject was not brought up until 1989 when Cairns and colleagues suggested the possibility that the Luria-Delbruck experiments could not detect non-random mutations. Cairns et al. (1989) employed an overlay method. They would first plate bacteria on minimal media lacking lactose; they would then add an overlay of media on top of the minimal media containing lactose and would observe mutants arising over the next few days. If they delayed adding the lactose overlay the mutants would also be delayed, appearing only after exposure to lactose. This was compelling evidence suggesting “that populations of bacteria, in stationary phase, have ways of producing (or selectively retaining) the most appropriate mutations” (Cairns et al., 1989). Then, what is the mechanism(s) generating mutations in non-dividing cells?

Stationary phase experiments in *E. coli* have revealed the importance of homologous recombination and error prone polymerases in the generation of mutations. Important to this research is the work being done on *B. subtilis*, a gram a positive bacterium that is showing a role for transcription in stationary phase mutagenesis. It was Sung and Yasbin (2002) that initially introduced *B. subtilis* as a model system for studying stationary phase mutagenesis. They created a strain they called YB955 that was auxotrophic for three amino acids and recorded their reversion frequency back to prototrophy under conditions of starvation. What they found was that not only did *Bacillus subtilis* exhibit mutations in stationary phase but that the different alleles they tested “showed diverse stationary phase mutation frequencies” (Sung &
Yasbin, 2002). Their work also showed that the accumulation of these mutations was influenced by ComK, ComA and independent of RecA. ComK and ComA are transcription factors involved in developing competence in *B. subtilis*. RecA is a protein involved in homologous recombination and for induction of the SOS response in *Bacillus subtilis*. These findings were important because RecA was previously found to be essential for stationary phase mutations seen in *E. coli*. This meant that the generation of mutations in *B. subtilis* was through a different mechanism not yet described or seen in other organisms. This 2002 paper briefly began to speculate what the possible mechanism driving mutations in non-dividing bacteria might be noting that the “process might involve a form of prokaryotic differentiation” and that their results supported “the existence of a hyper mutable subpopulation(s)” (Sung & Yasbin, 2002).

The development of subpopulations in bacteria under stress is supported by early work using microarrays that showed differential gene expression under different conditions by ComK and Sigma B. Boylan, Redfield and Price (1993) were among the first to look at SigB and suggested that Sigma B appeared to control a large stationary phase regulon in *B. subtilis*. Price et al. (2001) showed that in *B. subtilis*, sigma B was controlling more than 150 general stress related proteins. Sigma B is an alternative sigma factor that attaches to the RNA polymerase core enzyme under conditions of stress. Its attachment directs the transcription machinery to recognize and transcribe promoters for stress related genes, this Sigma B dependent response is known as the General Stress response for *B. subtilis*. Differential gene expression supported the idea that distinct subpopulations could develop in a culture under conditions of stress and that one of these subpopulations could be responsible for the mutants seen in stationary phase. The mechanisms driving the mutations although suggested to be linked to transcription, was finally demonstrated in 2010.

Building on previous work done in *B. subtilis* and considering ideas being brought forth by other research groups, Pybus et al. (2010) presented the idea referred to as transcription induced mutagenesis as the driving force for mutations. The hypothesis presented the idea that under condition of stress bacteria will differentially express genes and that these genes are preferentially targeted for mutagenesis. To prove this hypothesis the group examined reversion frequencies of a defective leucine allele in the previously described model system *B. subtilis*. Their assay consisted of putting a point mutation in the leucine gene that rendered the protein non-functional. They then placed this gene under regulation of an inducible promoter activated with IPTG in order to control transcription levels. Their results showed that reversion to leucine prototrophy paralleled increases in transcription levels. They went on to explain that, “such an association could explain why adaptive mutations often appear directed and how cells under these conditions avoid the accumulation of lethal mutations resulting in genetic load” (Pybus et al., 2010). The paper concluded with listing possible ways in which the process of transcription could turn into a mutagenic process in stationary phase while not being a major contributor to mutations in exponentially growing cells, the role of the formation of DNA secondary structures was mentioned as a possible cause for the formation of mutations in highly expressed genes.

Burkala et al. (2007) proposed that secondary structures, formed during the process of transcription, were hotspots for mutations, specifically at the loop portion of the stem loop structures. Their model began with explaining that during the process of transcription the DNA double helix must be opened up in order to create the mRNA. It is in this state, in the wake of the transcription machinery, that DNA is transiently found in single stranded form. DNA in single stranded form has the potential to form stem loop structures that if stabilized through increased transcription expose nucleotides to mutagenic agents in the cell that could cause them to mutate. They tested this model with an assay in *E. coli* where they created 4 different constructs. The four constructs consisted of engineering 4 independent nonsense mutations into the *E. coli lacZ* gene and test for reversion back to lacZ+ phenotype. The nonsense mutations introduced into the lacZ gene resulted in a loss of the enzyme b-galactosidase activity. B-galactosidase is responsible for breaking up sugars such as the disaccharide lactose into monomers for the cell to use. Results from this work showed that the stop codon located in the
loop portion of the stem had a higher reversion rate than the other constructs that were engineered to be in the double stranded portion or not in the structure at all. Reversion rate also increased with increased transcription. Burkala et al. (2007) provided evidence for a way in which transcription could be mutagenic in growing cells.

The idea that secondary structures have potential to generate mutations has independently been supported by Tornaletti, Park-Snyder, and Hanawalt (2007). In their work they present the idea that other transcription induced DNA structures, referred to as G4 loops, can be targeted for mutagenesis if gratuitously repaired after blocking RNA polymerase during transcription (Tornaletti et al., 2007). Their assays are important because they showed that G rich sequences forming G4 structures do block RNA polymerase. These results support the concept that secondary structures have the potential to block oncoming RNA polymerase and recruit repair proteins that can gratuitously repair the region enough times to generate novel mutations in stationary phase cells.

These ideas taken together are being extended to explain stationary phase mutagenesis in *B. subtilis* and provide support for my hypothesis.

Through the years evidence has been accumulating to suggest transcription as a mutagenic process that could explain the acquisition of mutations over time without experiencing genetic load in stationary phase cells. These findings have important implications for evolution since mutations have previously been described as being random. Transcription as a mutagenic process would influence both prokaryotic and eukaryotic organisms since transcription is a ubiquitous process.

**Experimental Approach**

Stem-loop structures are hypothesized to promote mutagenic events, particularly when the DNA regions containing such structures are transcribed. The mutability index, or MI, for a sequence forming a stem loop structure can be determined using a computer program called Zuker’s mfold algorithm (Zuker, 2003). The higher the MI value assigned to a given structure the more stable it is and more likely to accumulate mutations. Using this mfold program we found two genes in *B. subtilis* identified to form stable stem loop structures in their DNA sequence. *ThiF* is a gene involved in thiamin pyrophosphate biosynthesis (TPP). TPP is an essential cofactor for many enzymes involved in carbohydrate and amino acid metabolism (Schyns et al., 2005). The *argF* gene is involved in arginine biosynthesis, an essential amino acid (Mountain, Smith, & Baumberg, 1990). Molecular cloning exercises including PCR backtracking and PCR fusions yielded *thiF* and *argF* alleles that were affected in the ability to form stem-loop structures (see Fig. 1). For each gene STOP and UNSTABLE alleles were constructed and verified through sequencing. The STOP version contains a stable stem-loop structure with a high MI value; whereas the UNSTABLE allele forms stem-loop structures poorly correlating to a lower MI value. The stability of these constructs is based on the ability of bases to form hydrogen bonds in one strand of DNA compared to their ability to form bonds between two strands (normal conformation). The constructs were ligated to pHyperSpank cloning vector and transformed into a YB955 *thiF::neo* and YB955 *argF::neo* background. These strains have the native genes deleted and in their places is a neomycin cassette. This has been verified through PCR, pHyperSpank plasmid will recombine the constructs into the *amyE* locus of *B. subtilis* where transcription will be controlled through the addition of IPTG.

The experimental design includes growing the *B. subtilis* strains containing the STOP and UNSTABLE constructs to stationary phase in 25mls of PAB medium with trace elements. This involves keeping track of the growth curve of the strains through spectrometer readings. Once the strains reach stationary phase the cells are harvested, centrifuged for 10 minutes at 10,000xg and re-suspended in 1XSpizizen salt solution. The cells are then spread on complete media lacking either arginine or thiamine. Revertant colonies are scored for over a 9 day period. Every odd day starting from day one plugs will be taken from the plates to check the viability of the background cells. Numbers will be plugged into an excel sheet to generate graphs. Revertant colonies will be analyzed for suppressor mutations and a sample of them will be sent for sequencing to verify if the mutations were located in the stem loop region of the gene.

If stem-loop structures, hypothesized to be formed during transcription, have a role we should expect
to see the strain containing the STOP construct to accumulate more revertant colonies when compared to the UNSTABLE allele. Sequence analysis of mutations should reveal a map of where mutations occur in relation to the stem-loop structure.

Figure 1. Wild type, STOP and unstable alleles for thiF used in stationary phase-mutagenesis. A. shows the structure formed in a functional allele (it cannot not be used in mutagenesis studies). B. shows the STOP (defective) allele which exhibits the same ability to form stem-loop structures as the WT. C. shows the unstable allele. The same approach was adapted for argF.

DATA ANALYSIS
Preliminary data performed by a previous lab member showed that there is a difference in revertant counts between the stop and unstable strains with the stop accumulating more mutants. Although this preliminary data did not account for the possible role of recombination in the revertant counts, it does suggest that stable stem loops do have a role in stationary phase mutagenesis. Strains constructed in this work eliminate the possibility of recombination and should provide a more accurate understanding of the role of secondary structures in B. subtilis stationary phase cells.

CONCLUSION
If my hypothesis is correct then future experiments would include knocking out genes involved in repair such as transcription coupled repair gene mfd. Mfd preferentially directs repair proteins to transcribed genes. Future experiments could include altering the supercoiling levels of the strains to see if DNA topology has an effect on revertant numbers. To provide further evidence that stem loop structures are forming and are indeed blocking RNA polymerase, in vitro transcription run off assays can be performed.

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ABSTRACT
Posttraumatic stress disorder, better known as PTSD came to light during the Vietnam Era. Throughout history, this stress disorder has been called various things in the 150 years since it was first recognized. However, each new word had several characteristics in common, such as re-experiencing, numbing and physiological arousal. The process of Darwinian “natural selection” corroborated the evolution of people with highly developed stress responses. Those pre-historic people with the most useful “fight or flight” reflexes became our ancestors. An example of this is that during the 19th Century, PTSD was called "Railway Spine” and was associated with what we would today call “hysterical” physical symptoms such as “anxiety” expressed as bodily complaints. This disorder was seen in individuals who had been involved in railway accidents but had not suffered bodily injuries. During traumatic events, it is expected for people to be resilient. However, some endure the psychological stress of the trauma exposure in a different way, developing distress, psychiatric illness, and exhibit health risk behaviors. In fact, after trauma exposure an altered sense of safety, increased fear and arousal, and concern for the future, can affect not only those who acquire mental health troubles (Ursano et al., 2007). It may also affect those who continue to work and care for their families and loved ones (Ursano et al., 2007).

PURPOSE
For the intended purpose of this literature review, the scope will be limited to a discussion of the availability of research conducted on this particular topic. It is important to see if there are gender discrepancies in rates of service connection for posttraumatic stress disorder (PTSD) and, if so, to see if these discrepancies could be attributed to appropriate subject characteristics such as differences in symptom severity or impairment (Neria et al. 2007).

A study was done using randomly selected veterans who were seeking VA disability benefits for Post-Traumatic Stress Disorder. Men were found to use the benefits far more than women. Adjustment for PTSD symptom severity or functional impairment did not have an effect on these results; conversely,
adjustment for dissimilar rates of combat exposure did. They found that the rates of service connection were higher for women than men. However, there was evidence of a combat advantage that disproportionately favored men. The appropriateness of this noticeable advantage is unclear and therefore, needs further investigation.

DEFINITION
According to the Diagnostic and Statistical Manual of Mental Disorders (3rd ed., rev.; DSM-III-R) operationally classifies disorder in essence as "statistically unacceptable suffering or disability." This classification is an attempt to categorize two basic principles: that a disorder is harmful and that a disorder is a dysfunction (i.e., an inability of some internal mechanism to perform its natural function). Although, the classification falls short to summarize the idea of "dysfunction" and so fails to validly distinguish disorders from non-disorders, leading to invalidities in many of DSM-III-R's particular diagnostic criterion. Problems with legitimacy are traced to DSM-III-R's stratagems for strengthening steadfastness (PsycINFO Database Record APA, 2012).

INTRODUCTION
Every day communities and individuals are exposed to traumatic incidents; whether they are inflicted by humans or naturally occurring situations. Resilience is generally the expected response, but for some, post-traumatic stress disorder may be an occurrence. It is important that these individuals' brain models receive a more intimate understanding in the phenomenology of the disorder. Among several models, importantly, is the perspective that PTSD is considered a "forgetting" disorder. Other elements in the onset and triggers of PTSD can identify further models to examine at the bench.

Individuals and societies are exposed to an extensive array of traumatic events each day. They can be anything from motor vehicle accidents, natural and human disasters, and so many others that some individuals may consider minuscule. The human psychological responses do show resilience, transient distress responses including variation in emotional function, cognition, and health risk behavior, and or some individuals' longstanding and disabling psychiatric illness (Bisson, 2007). An assemblage of symptoms may be present in sufficient intensity and duration to warrant the diagnosis of Post-Traumatic Stress Disorder (Bisson, 2007).

LITERATURE REVIEW
Post-Traumatic Stress Disorder, also known as PTSD, is defined as an anxiety disorder that develops after having a history of exposure to a traumatic event in which severe physical harm took place or was threatened. The victims’ family members can also develop the disorder. PTSD occurs in people of any age, including children and adolescents. More than twice as many women as men are known to experience PTSD following exposure to trauma. Depression, alcohol or other substance abuse, or other anxiety disorders frequently co-occur with the onset of PTSD.

Diagnostic criteria for PTSD include a history of exposure to a traumatic event meeting two criteria and symptoms from each of three symptom clusters: intrusive recollections, avoidant/numbing symptoms, and hyper-arousal symptoms. A fifth criterion concerns duration of symptoms and a sixth assesses functioning. Various epidemiologic survey analyses have established that posttraumatic stress disorder (PTSD) is found twice as common in women as in men. Also, there are gender differences in the specific type of trauma they were exposed to, the appearance of the illness, and co-morbidities that can occur with it. Assortments of these differences are clearly societal and non-biologically based, but in addition, it is clear that the biologic systems altered in PTSD may modulate or be modulated by sex hormones.

PTSD may be conceptualized in a number of ways including a response to a vituperative exposure that becomes indiscriminate and maladaptive. Failure in our recovery systems such as an injury that results in a brain failure can be a disorder of "forgetting", or a failure of extinction learning (Irish, L., Fischer, B., & associates 2011). Animal models of behavioral changes in response to environmental stressors have led to an improved understanding of the molecular neuropathology of PTSD and to the examination of the genetic basis of PTSD (Irish et al., 2011.)

Currently, pharmacological and psychosocial treatments for this disorder target the neurocircuitry of fear-related learning, memory
formation, and extinction (Watson & Shalev, 2005). Modern pharmacologic medicines can enhance response to psychosocial interventions by accelerating the process of extinction learning (Watson & Shalev, 2005). Animal models of resilience to traumatic exposure are continually surfacing, so they may show clarification of the genetics prevailing resilience to traumatic exposure to the identification of genetic biomarkers for this disorder and new ideas for therapeutic intervention (Bisson, 2007).

Rachael Yehuda, Ph.D. of the Einstein Medical Center, Bronx, NY, described the connection, neuroendocrine, neuroanatomic, and immune-related foundations for a variety of gender differences seen in PTSD during this year’s Annual Meeting of the American Psychiatric Association. Dr. Yehuda executed a retrospective investigation of analysis pertaining to biologic metamorphisms connected with PTSD. The data implied that females had a declining baseline cortisol levels than the male subjects, but the PTSD status itself was not gender related. That is to say, females with and without PTSD had reduced cortisol than males who were with and without PTSD. However, there were some minute gender variations in response to the dexamethasone suppression test.

According to The Free Medical Dictionary Online (2012), a dexamethasone suppression test is “the determination of blood cortisol levels before and after administration of dexamethasone assists in diagnosing Cushing's syndrome and identifying the cause, depending on the protocol and dose used. Dexamethasone suppresses pituitary secretion of ACTH in normal animals and therefore the blood level of cortisol is decreased; low doses do not suppress cortisol levels in dogs with pituitary-dependent Cushing’s syndrome, high doses do. Cortisol production by functional adrenal tumors is not affected by dexamethasone.” There was greater suppression in women than in men, indicating greater deregulation of the glucocorticoid receptors. In reviewing a number of studies of immune function measures, Dr. Yehuda found no PTSD-specific gender-related differences in cytokine levels (Yehuda, 1999).

Other studies have demonstrated reductions in hippocampal volume in those diagnosed with PTSD. Analysis that studied sex differences associated with this discovery have further established hippocampal volume is more diminished in males than females. Furthermore, women with PTSD have a lesser amount of memory loss and impairment in cognitive function than their male counterparts. Dr. Yehuda deduced that there are some PTSD-specific gender dissimilarities in the biologic irregularities seen in those with PTSD, but, in general, there appears to be more similarities than differences. However, there are gender dissimilarities in stress response (Yehuda, 2001).

Prevalence

PTSD was originally associated with veterans of the Vietnam War, but is now being associated to various trauma inducing experiences such as rape, abuse, environmental disasters, accidents, and torture (Ursano & Blumenfield, 2008). Current studies have demonstrated that around 50% of veterans, 45% of battered women, 50% of sexually abused children, and 55% of adult rape victims are most likely to experience PTSD at some point in their lifetime (Ursano & Blumenfield, 2008).

Most studies and reviews focus on military veterans, but there is increasing interest in other groups who are susceptible — health workers, police, and fire fighters. Researchers in the UK found a prevalence rate of 15% for PTSD symptoms amongst suburban police officers (Ursano & Friedman, 2006). Rates in urban police officers and officers in armed situations may be higher. Prevalence rates for PTSD in the community are probably about 2–5% (Ursano & Friedman, 2006). Rates of PTSD in police forces are therefore likely to be four to six times higher than in the general public. Rates of PTSD symptoms in professional fire fighters may be as high as 18% (Ursano & Friedman, 2006).

There is no precise number for how many soldiers suffer from PTSD; however, the Department of Veterans Affairs states that more than 177,000 Iraq and Afghan war veterans have received a provisional diagnosis of PTSD (Boone, 2011). This number does not take into account those who are currently on duty or veterans who seek care outside of the VA system. Unfortunately, it is reported that the VA has labored with diagnosing and treating those affected (Boone, 2011). In May 2010, the U.S. Court of Appeals for the Ninth Circuit stated, “the VA’s unchecked incompetence in meeting the psychological needs of soldiers violated their
constitutional right to due process, and mandated that the department completely overhaul its mental health care system (Boone, 2011).

This occurs when things such as bureaucratic delays, case backlogs, and shortage of qualified medical personnel, and stringent documentation requirements impede or hinder disability compensation and treatment in many instances—and what sufferers do receive is often inadequate (Boone, 2011). In addition to this, treatments vastly vary, from medication to intensive one-on-one therapy. Whether or not the soldier is on active duty also has an effect, as the VA’s treatment is often different from the Army’s (Boone, 2011).

Assessment

Post-traumatic stress disorder (PTSD) can develop following a traumatic event that threatens one’s safety or renders them helpless. Most people associate PTSD with soldiers, as military combat is the most common cause associated with men, but any devastating life occurrence can produce PTSD, especially if the event feels uncontrollable and unpredictable (Cantor, 2005). Post-traumatic stress disorder (PTSD) can affect those who personally experience the event, those who witness it, and those who pick up the pieces afterwards, including emergency workers and law enforcement officers (Cantor, 2005). It may emerge in the friends or family members of those who went through the initial trauma. PTSD develops differently from person to person. While the symptoms of PTSD most commonly develop in the hours or days following the traumatic event, it can sometimes take weeks, months, or even years before they appear (Cantor, 2005).

If PTSD is left untreated, serious consequences can occur, such as an incident in 2002 when five soldiers who recently returned from Afghanistan, murdered their wives and two killed themselves as well (Boone, 2011). All five soldiers were stationed at Fort Brag in North Carolina (Boone, 2011). It is not uncommon for homecoming soldiers to talk about suicide and homicide. They may do this directly or say things such as “everyone would be better off if I were not around.” These comments should never be taken lightly.

Treatment

Treatment for post-traumatic stress disorder focuses on getting control back in your life. When a person is involved in a traumatic experience, post-traumatic stress disorder may result due to the person not coming to terms with the event that occurred. Symptoms may possibly get worse over time and can last for an extended amount of time. When an event such as this occurs, it is best to obtain immediate treatment that is needed for relief. The sooner treatment is sought, the lower the risk is of PTSD becoming a long-standing problem. Trauma focused cognitive-behavioral therapy is commonly used to treat PTSD. This involves carefully and gradually “exposing” oneself to thoughts, feelings, and circumstances that remind them of the trauma (Kessler, Galea, & Gruber, 2008). Therapy also involves identifying upsetting thoughts about the traumatic event—particularly thoughts that are distorted and irrational—and replacing them with more balanced picture (Kessler, Galea & Gruber, 2008).

Another option is family therapy due to the fact that PTSD affects both the person and their family. This treatment can help the people close to them better understand what they are going through. It can also assist in family communication so that they can work through relationship problems caused by PTSD (Luxton, Skopp & Maguen, 2010). Medication is sometimes prescribed to allow people with PTSD to lessen secondary symptoms such as depression or anxiety (Bisson, 2007). It is reported that antidepressants such as Prozac and Zoloft are the medications most commonly used to treat PTSD (Bisson, 2007). Antidepressants may lessen the feelings of sadness, worry, and feeling. However, they do not treat the actual causes of PTSD.

A newer treatment is known as EMDR (Eye Movement Desensitization and Reprocessing). It incorporates elements of cognitive-behavioral therapy with eye movements or other forms of rhythmic, left-right stimulation, like hand taps or sounds (Cantor, 2005). Eye movements and other bilateral types of stimulation are believed to work by “unfreezing” the brain’s information processing system, which is interrupted in moments of severe stress (Cantor, 2005). There is no “quick-fix” for PTSD, and can in fact months, to years, to a lifetime. It is important for people suffering from PTSD to remember that their lives will not always be filled with hard times, suffering, and pain.
CONCLUSION
As with any assessment or supposition, there will always be possible problems; which is why it is important to address such things early on. It is hoped that further research and theories may be generated and inspired from this piece. It has become widely known that mentally ill female veterans obtain a less significant amount of their care from the Department of Veterans Affairs (VA) facilities than the mentally ill male veterans receive. This may be because women are less likely than men to be service connected for psychiatric disabilities (Kessler et al., 1995). Veterans have documented, compensative circumstances associated to or aggravated by military service. They receive priority for enrollment into the VA healthcare system. It is for this reason as well as other gender differences associated with PTSD that substantiate the need to examine this subject in further detail.

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ABSTRACT
The prevalence of Female Genital Mutilation and the difficulty in preventing its practice call for a fresh way of resolving the problem. As the availability of medical professionals equipped with the ability to correct clitoral mutilation grows, there is also an increasing need for professionals that can help the victims after the reconstructive surgery. Post-operative therapy for victims that have opted to receive reconstructive surgery is necessary in order to fully recover. Furthermore, more research in this area is needed to support the findings of this review and will fill the physical and emotional gap exhibited in prior studies related to Female Genital Mutilation.

INTRODUCTION
The word heinous is defined by the Merriam Webster Dictionary as, “Hateful or shockingly evil.” There are innumerable accounts of injustice against mankind, some more ghastly than others and Female Genital Mutilation is one of them. According to the World Health Organization (WHO, 2012), Female Genital Mutilation (FGM) also known as Female Genital Circumcision, Excision or Cutting is the procedure or procedures including “partial or total removal of the external female genitalia, or other injury to the female genital organs for non-medical reasons.” Recent breakthroughs in surgical procedures have given doctors the ability to reconstruct the clitoris and give a victim of Female Genital Mutilation (FGM) the physical capacity to have a normal sex life. By reviewing current literature regarding female genital mutilation, this study highlights the increasing need for therapy among women who have undergone reconstructive surgery and its importance to full recovery and living a complete and healthy life.

Most commonly practiced in Africa, Asia and the Middle East those most at risk are girls from infancy to 15 years old with approximately 140 million girls and women around the world coping with the effects (WHO, 2012). There is a rise in awareness of Female Genital Mutilation (FGM) and initiative is being taken to prevent its occurrence as well as penalize those who perpetuate its practice. For example, according to the Foreign and
Commonwealth Office, the Female Genital Mutilation Act was put into effect in March of 2004 which prohibits the practice of FGM in the UK, assisting or supporting the procedure, and penalties including prison time and fines for any involvement in such acts. In the miraculous event that Female Genital Mutilation was to cease spontaneously, there are still millions of women already affected. More measures need to be taken to follow up with these women after they have undergone reconstructive surgery. Therefore more emphasis needs to be placed on life after the surgery and developing the victims coping mechanisms for issues such as self-esteem and relationships with family and partners. Currently, in order to undergo reconstructive clitoral surgery through an organization called Clitoraid, victims must go through multiple preliminary counseling sessions to ensure they are fully prepared. It is beneficial for these women to have just as much care post-surgery.

The reconstructive surgery devised to recreate the clitoris, forged by Pierre Foldès MD, is a medical feat. During countless cases of FGM only part of the clitoris is cut off, leaving a stump covered by scar tissue. Only a handful of doctors around the world have the knowledge and ability to remove scar tissue, expose the clitoris, and make sure it is in the correct position. According to “Female Genital Mutilation/Cutting and Orgasm Before and After surgical Repair,” reconstructive surgery has four outcomes: it creates a new clitoris, makes the clitoris more appealing visually, increases clitoral pleasure, and, “resolves pain at the site of excision.” This article also stated that having an intact clitoris helps the victims regain their female identity, which was supported by 100% of the people sampled. The thought that it heals sexual dysfunction was supported by 90%, and 50% of that sample supported the idea that it reduces pain during intercourse (Paterson, 2011). While there have been a small percentage of cases that reported pain after their surgery, the majority of those who have been fortunate enough to receive the reconstructive surgery have shown great potential for normal sexual functioning. Also, some women prefer not to have the reconstructive surgery. These women often undergo the circumcision at the age of 6 or 7 and are raised in a culture that conditions them to believe this practice is legitimate and necessary. These customs and beliefs exacerbate the issue and further deteriorate efforts to end this cruel practice.

There are countless studies on Female Genital Mutilation. Unfortunately, little research can be found on the topic of the emotional distress that the victims face. Traditionally research focuses on reasons why people continue the practice, how the procedure is done, where it is most prevalent, the aspect of human rights, and the law surrounding this social justice issue as well. It is predominantly women who are relatives or individuals close to the family that carries out the procedure. Furthermore, scholars often ask why it is women of FGM that are actively propagating this practice. In His book “The Circumcision of Women: A Strategy for Eradication,” author Olayinka Koso-Thomas (1987) contributes to the understanding of why women continually submit to Female Genital Mutilation.

Koso-Thomas (1987) found that the first factor is ignorance. He argues that the rate of Africans that know what normal genitalia looks like is extremely low. The idea of their bodies as a source of pleasure is a foreign concept. In addition, the general belief is that a woman’s body is her husband’s property and is to be used for his pleasure and the baring of his children. Many of the women are raised not to touch or look at their genitalia unless absolutely necessary to clean or inspect when there is pain. Author Olayinka Koso-Thomas (1987) goes on to explain that sexuality for women is a taboo topic, to even speak about ones sexuality with their husband is frowned upon. Female Genital Mutilation is one tool among many used in some societies to proliferate the idea that a woman’s sexuality should be suppressed.

The second factor is in regards to religion and spirituality. Despite research showing that FGM is not required or supported by any religious text, but according to the U.S. Department of Human Services and Health on Women’s Health people maintain that religion is connected because it sometimes practiced during religious ceremonies. There is a lot of fear among those that do not conform. Some believe that Female Genital Mutilation is a way to express spiritual obedience and devotion. The book Female “Circumcision” in Africa: Culture, Controversy, and Change states that Female Genital Mutilation is common at initiation rituals practiced by the Madinga people of Guinea-
Bissau (Shell-Duncan, Hernlund, 2000). The book expounds on the idea that one of the many motive for clitoridectomy among Muslims is the, "cleansing rite that defines a woman as a Muslim and enables her to pray in the proper fashion." This notion was translated in the Quran from one of Mohammed's stories. Women, "put the ideas of female circumcision into their heads," thus beginning a long standing culture of genital mutilation (Shell-Duncan, Hernlund, 2000, p. 219-221). Amidst the numerous explanations for the continuation of FGM acculturation is at the forefront.

The last factor is about women’s distorted view of themselves created by their cultural perspective. With many of these cultures where Female Genital Mutilation exists, it is normal for women to endure great burdens without complaint. They work hard in and out of the home with no appreciation from their partners and family. This lack of acknowledgement and positive reception can result in low self-esteem. These women begin to internalize harsh portrayals of themselves as property and being unworthy. This inaccurate misconception leads victims to believe it is necessary for their daughters, nieces and grandchildren to suffer this rite of passage. What these women do not realize is that they are systematically oppressing each other through this practice, further hindering them from growing as a community and gender.

One article written from the perspective of a nurse pointed out the impact that one’s culture can have on what medical decisions a patient might make. The article describes the concept of marginal living as, “passive in the pushing/pulling tension between two cultures while forging new relationships in the midst of old and living with simultaneous conflict and promise.” (Burke, 2011) This frequently occurs among victims that have ties with or move to a different country. The young 23 year old woman in this article went to the doctor because she was experiencing whitish discharge and vaginal itching, and was diagnosed with the bacterial infection Candidiasis. While this is a common infection for women easily remedied with antibiotics or topical creams, the nurse had to prescribe a different type of medication as a result of the severity of her vaginal mutilation. Of the four types, she was a victim of the most severe form of Female Genital Mutilation known as Infibulation which is the narrowing of the vaginal opening and partial or complete removal or the external genitalia (UNFPA, 2012). She must decide whether she should undergo Western remedies or stay true to her traditional roots. In the midst of making difficult medical and personal decisions she will internalize the societal pressure which would manifest in the development of a distorted view of herself and her culture.

There are four ways that a victim can exhibit marginal living. The first is assimilation, which is when a victim absorbs themselves in a new culture. Feelings of, “Self-denial, self-hatred, and feelings of guilt” accompany assimilation (Burke, 2011). Second, reconstructed return entails a victim returning to their culture with the influence of a new culture in mind. This effect can push a victim to revert to their traditional way of thinking. Next, the effect that causes a victim to feel as though they are culturally “homeless” is called Poise (Burke, 2011). In this case one becomes detached from either culture. Last, integration is when a victim integrates their old culture with the new culture with which they identify. This is the best case scenario because a victim that is able to do this can function better socially and have an easier time transitioning between cultures.

Another circumcised woman from Tanzania became a victim in 1978 when she was forced to undergo the procedure by her parents. Like many other victims the procedure took place in poor hygienic conditions. She lost a great amount of blood and was unconscious for days. After recovering, two years later, she was unable to return to school and was forced to marry. She was infertile as a consequence of the mutilation and never bore children. As a result of these experiences she met with the committee that handles “outdated customs and traditions” in her area to elevate the pressure put on those that support the ongoing tradition (Skaine, 2005, p. 205). This is just one common story of pain and misfortune among many of the victims of Female Genital Mutilation. This woman’s actions display a poise reaction to her culture in which she did not completely abandon her culture or immerse herself in a new one, but wanted to integrate her cultures ideals with a more modern view. She did not undergo clitoral reconstructive surgery but her story emulates the cultural issues that all FGM victims face.
Despite social pressures and systematic oppression, there are many reasons victims of Female Genital Mutilation may or may not choose to receive reconstructive surgery. Societal oppression can cause depression, anxiety and strife in relationships without the added physical damage of FGM. According to Dr. Larry Ashley, Ed.S, LCADC, and CPGC, a leading expert in sexual trauma, age, acculturation, and how a woman felt about her body prior to reconstructive surgery are of great importance in assessing the mental health of victims. He also stated that women may be opting for surgery due to other motivating factors. There may be pressure from a partner to get the reconstructive surgery which can lead to discord in the relationship. It affects a victim’s ability to marry, increases the chances of infertility and can affect the quality and stability of a marriage according to Female Circumcision in Africa (Shell- Duncan, Herlund, 2000). In most instances women are still ignorant about their own bodies and need proper guidance after surgery to become educated about their anatomy and how that relates to their relationships.

Simple sex education and composition of the female body are among the lessons that a victim of FGM must learn. How to touch one’s self and understand that is alright to have certain desires also encompasses the need for post therapy sessions. In addition a victim will need to communicate these new found skills and concepts to their partners who may need to readjust to the change. It is confusing for victims to interpret all the new sensations and changes in their body and comprehend what these sensations entail. Another very scary thought for these women after surgery is how their family may react and treat them. For those that get the surgery in a foreign country, some must inevitably go home and face their antagonists. They face the risk of being attacked and mutilated further for their actions. Other penalties include being disowned and/or ostracized from their church. This can have lasting affects emotionally. The victim must decide to keep this secret to themselves, cease communication or endure whatever ridicule awaits them.

CONCLUSION
The area of study for post-operative therapy for victims of Female Genital Mutilation is new territory. There are many avenues of research to be done in this field. Primarily, a study on the effect of counseling for victims that have undergone reconstructive surgery needs to be done. It is imperative to have empirical evidence that supports the claim that counseling would be helpful. Sessions from this proposed study would be mandatory when a patient decided to go through with the surgery, which is comparative to a follow up exam. Sessions would be conducted one on one with a therapist and in small groups in the hope that a woman would have a better understanding of her sexual functioning and assistance with personal concerns like, guilt, shame, and self-image.

In conclusion, important aspects affecting a victim’s complete recovery is the presence of preexisting problems such as depression, trust issues and/or sexual dysfunction. Despite doctor’s best efforts and surgical feats, these internal battles will still continue to take their toll on victims and their families. While it is important to address the physical trauma caused by FGM, these internal battles highlight the significance of the psychological components of Female Genital Mutilation. Providing post-surgical counseling is not only paramount to a victim’s full recovery, but is important to addressing the root of societal problems that allow this practice to continue.

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USING IMAGE PROCESSING TECHNIQUES TO ESTIMATE THE AIR QUALITY

BY ERNESTO ZAMORA RAMOS

ABSTRACT
The color of the daylight sky when not looking directly into the sun varies depending on the composition of the air. The particles lingering in the atmosphere scatter the components of the light based on their wavelength in relation to particle size. Thus, the color of the sky depends on what wavelengths are scattered while the light travels through our atmosphere. By analyzing the color of the sky using computer imaging processing, it is possible to determine the quality of the air in an area.

INTRODUCTION
The purpose of this research is to use computer image processing techniques and statistics to study the irradiated tonality of the sky and its relation to air pollution. The sky color variations from shades of blue to shades of gray indicate higher levels of concentration of particles bigger than clean air normally contains. Using image processing, a computer can recognize the differences in color and determine the quality of the air in the area where a picture of the sky was taken.

The color of the sky is explained by the Mie solution to Maxwell’s equations and Lord Rayleigh’s scatter approximation theory. The white light is composed of the full range of visible colors from violet to red. The air is composed approximately of 78.084% Nitrogen, 20.947% Oxygen, 0.934% Argon, and 0.0350% other gases [1]. According to Raleigh scatter, the small size of the Nitrogen and Oxygen molecules scatter the light waves in the shorter wavelength range, i.e. blue to violet spectrum, turning the sky blue. Larger molecules scatter longer wavelength colors. When the concentrations of larger molecules such as pollutants increase, the scattering of these longer wavelength colors becomes more significant. The scattered wavelengths mix, making the blue sky lighter even making it look completely white or a shade of gray when pollution levels or water vapor molecules that cling together or attach to other molecules are high. This is why clouds look white or gray.

The color of the sky helps determine how clean the air is since lighter colors show the presence of...
water vapor, sulfur, aerosols and soot in the atmosphere. Usually, people inside an area with levels of air pollution above normal cannot see the contaminants, unless their levels are extremely high. It is difficult to determine whether there is smog while inside of the smog cloud. A computerized analysis of an image of the sky in the area can determine, however, the pollution. Using this technique an air quality map can be generated for a whole location, such as a city, by using images obtained from a network of cameras.

**Previous Studies**

**Color of the Clear Sky**

Colors are simply the visual perception of the brain due to the stimulation of the eye receptors by the wavelengths of the electromagnetic spectrum. The human eye’s receptors react to a small portion of the electromagnetic spectrum, called the visible spectrum, or visible light [2].

As explained by Sir Isaac Newton, white light is the composition of all the colors of the visible spectrum. If we let a ray of white light pass through a transparent colored surface, for example, red, the projected light color will be perceived as red. This is because the material absorbs and blocks all other waves that compose the white light, letting through only the wave with frequency pertaining to the red light. Any surface illuminated by the filtered ray receives only red light.

The phenomenon that makes the sky blue is different from pure electromagnetic waves absorption or blocking like in the previous scenario. If the color of the sky were caused by absorption of other colors, then, the light we would see from the sun illuminating the surface would be blue, since all other colors of the spectrum would have been absorbed by the atmosphere. The sunlight that illuminates the surface of the Earth is, however, yellowish to white and even red during sunrise and sunset. Even though the sun’s radiation is attenuated by absorption in the Earth’s atmosphere, the main cause for the blue color of the clear sky is caused by radiation scattering [3].

In a given direction, skylight is light scattered by all the molecules and particles in its path from its source, the sun, to an observer on Earth. Since the atmosphere is composed mainly of Nitrogen and Oxygen molecules, these are the most frequent molecules that light would encounter in its trajectory. British physicist and mathematician Lord Rayleigh concluded that electromagnetic waves with shorter wavelengths are affected by particles much smaller than their wavelength, scattering the waves in different directions. Waves in larger wavelength range are not affected by these small particles. As a result, the blue and violet waves from the white light are scattered while traveling in the clean atmosphere, turning the sky blue due to the blue color scattered and reaching the observer eyes from every direction [3]. The lower intensity of the violet color compared to other colors in the light coming from the sun combined with the lower sensitivity for this color by the human eye is the reason why the sky looks blue, instead of violet, even though violet wavelength is smaller than blue and scatters even more [3].

**Observations**

Color histograms of the tristimulus values (color channels red, green and blue) are used to obtain data and analyze images throughout this study. We can see in Figure 2 how the abundance of the colors in the color histogram of a picture of clean sky, shows that blue hues are more predominant, then green and least red.

When aerosols saturate our atmosphere, the particles larger size also scatters the waves with
The color of the daylight in a region of the sky is dependent of the position of the sun in the firmament and the angle between where the observer is looking at and the zenith [6]. The best observation angle is about 45° away from the sun; looking closer to the sun makes the blue hues lighter due to the higher intensity of the light. Observing the color of the sky, therefore, should be done preferably at a specific hour.

**METHODOLOGY**

**Hypothesis**

These study and methods are based on the theory that the daylight sky turns grayer when waves in the longer wavelengths of the visible light are also scattered, meaning that the concentration of bigger particles in the air is higher than normal, making the three colors in the picture histogram get closer with greater overlap.

**Collecting Data**

Analyzing various images of the sky in various locations where pollution levels are known we can create benchmarks that a computer can use to compare other sky pictures to and determine the cleanliness of the air.

Through observation, the simulated color histogram of the sky in an area of clean air looks like in figure 4. Note that there is little to no overlap of distribution of the colors.

For the study, several pictures of the blue sky were taken in areas where air pollution is supposed to be minimal such as in the middle of the desert in a day with little wind and dust, and over the sea.

Studies have shown that a digital camera is more susceptible to color changes than a human observant [5]. Sky color analysis has usually been done in a qualitative manner [6]. The higher susceptibility of a digital camera can be used by computer software to distinguish better between color shifts. This would produce better and more consistent results than human observant would.

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Pictures of the sky in polluted areas have been also obtained.

Figure 4 - Simulated color histogram of the sky color through clean

Figure 5 shows the locations where the benchmark pictures were taken. The same camera was used to take all the pictures maintaining the same parameters for all of them: Camera Kodak Z1285; exposure time: 1/800 seconds to 1/1200 seconds; Focal length: 8 mm; ISO Speed: ISO-64; Exposure bias: 0 step; Resolution: 12 MP (4000 pixels x 3000 pixels), 480 dpi horizontal and vertical, 24 bits per pixels.

**DATA ANALYSIS**

The data was separated into two groups based on clean air or polluted air samples. A computer program was developed to generate the color histograms for the pictures as well as reports based on these histograms. This program was later extended to estimate if a picture of sky was taken in a clean air or dirty air environment.

The samples were analyzed to determine the expected value for each color channel: red, green and blue. The following expected value formula was used [7]:

\[
\bar{a} = E(a) = \sum_{i=0}^{255} w_i(a) \cdot i
\]

Where:
- \( a \) is the color channel being analyzed (red, green or blue).
- \( w_i(a) \) is the weight of the color channel \( a \) at intensity \( i \) and \( \sum_{i=0}^{255} w_i(a) = 1 \)
- \( 0 \leq w_i(a) = \frac{a_i}{\text{Total}_a} \leq 1 \)

The expected values form C clean air and D polluted air distribution sets in the Euclidian space. The idea is to measure the distance from any new picture expected color value vector

\[
\bar{x} = \begin{bmatrix} \bar{r} \\ \bar{g} \\ \bar{b} \end{bmatrix}
\]

to each of these two sets. The obtained distance is used to estimate the probability of the new test point belonging to a set or the other. The shorter distance means that the probability that the analyzed value belongs to the clean air set or to the other is greater.

To measure the distance, all the expected values were averaged to obtain the mean values or center of mass for the clean air and polluted air sets, named vectors

\[
\mu_c = \begin{bmatrix} R_c \\ G_c \\ B_c \end{bmatrix} \quad \text{and} \quad \mu_p = \begin{bmatrix} R_p \\ G_p \\ B_p \end{bmatrix}
\]

respectively.

Euclidian distance should not be used in this case since the distribution of the points of each of these sets are not equal and are also based on their standard deviations from the mean (expected) values. In statistics, Mahalanobis distance is the method of choice for cluster analysis and
classification problems. This is a scaled distance that takes into consideration the variability of the variables in each set. The definition of Mahalanobis distance based on our current parameters is [8]:

$$
\Delta^2 = (\mathbf{x} - \mathbf{\mu})^T S^{-1}(\mathbf{x} - \mathbf{\mu})
$$

Where:

- \( \mathbf{x} \) is the expected color value for image being analyzed.
- \( \mathbf{\mu} \) is the mean value for the set the distance is being calculated to, \( C \) or \( D \).
- \( S^{-1} \) is the inverse of the sample covariance matrix [9].

\[
S = \begin{bmatrix}
\sigma_r^2 & \sigma_{rg} & \sigma_{rb} \\
\sigma_{gr} & \sigma_g^2 & \sigma_{gb} \\
\sigma_{br} & \sigma_{bg} & \sigma_b^2
\end{bmatrix}
\]

Where:

- \( r, g, b \) are the color channels.
- \( \sigma_{ab} \) is the covariance of color channels \( a \) and \( b \) of the image in question [10].
- \( \sigma_a^2 = \sigma_{aa} \)

\[
\sigma_{ab} = E[(a - \bar{a})(b - \bar{b})] = \frac{\sum_{y=0}^{m} \sum_{x=0}^{n} (a_{xy} - \bar{a})(b_{xy} - \bar{b})}{mn}
\]

Where:

- \( \bar{a}, \bar{b} \) are the expected values of the color channels \( a \) and \( b \) of the image in question.
- \( x, y \) are the column and row coordinates respectively for the pixel analyzed.
- \( m, n \) are the number of rows and columns of pixels respectively that form the currently analyzed image.

In summary, we calculated the Mahalanobis distance from the expected color value of a picture of the sky to each of the benchmark sets’ center of mass. The smaller distance implies that there is greater probability that the analyzed sample belongs to such set.

**LIMITATIONS OF THE STUDY**

Image processing and observations are based on colorless gas contaminants that are able to scatter the light effectively. Colored pollutants in the air, such as colored gasses or black smoke emanations can still trigger a pollution warning with these methods; however, the pollution or cleanliness levels cannot be accurately determined since the analysis is based on the shades of gray and blue that the sky color can change to.

**CONCLUSION**

The theory presented in this document was applied and implemented in a computer program with good results. The software was able to recognize polluted air images from clean air images of the sky. Pictures that the common human eye could not appreciate a marked difference were successfully identified by the computer. The techniques used for this software not only can they be used to determine air cleanliness, but can be applied to other fields where mathematical classification of items is needed and a computer can perform the task.

**FURTHER STUDY**

This is actually an ongoing study. A larger data collection will increase the accuracy of the software by consolidating the classification sets and reducing their overlap.

Further analysis is being done and theory is being researched with plans to enhance the software to be able to determine the kind of pollutants existing in the air from the color changes in the sky.

**REFERENCES**


Since 1978, the Center has assisted with graduating tens of thousands Clark County students from high school and/or college. Low-income and at-risk students in our community have been afforded the opportunity to enjoy academic and educational experiences that would otherwise not be available to them.

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In support of its mission, the Center strives to inspire positive behavior that reflects an appreciation for one’s self and others, establish a value system for a higher quality of life and, most importantly, instill that education is a major component in achieving success in our society.

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