

# ***ASTRA***

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*Message from Provost and Vice Chancellor Patricia A. Kleine*



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This journal presents the culmination of two years of students working with their faculty mentors on critical questions in their disciplines and preparing their research for professional publication and presentation.

To the students, congratulations on the completion of your research projects and best wishes for continued success in graduate school.

To my faculty colleagues, thank you for mentoring these remarkable students so well. I continue to celebrate your exceptional commitment to student success.

To the reader, I hope you enjoy reviewing this journal and the wealth and breadth of research within it.

*Patricia A. Kleine  
Provost and Vice Chancellor for Academic Affairs  
September 24, 2018*

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## Judicial Scrutiny and Disability

By:

**Nathan Altmann**

Mentor: Dr. Eric Kasper

The traditional legal options for pursuing disability discrimination cases have largely been limited to strategies that rely on legislation like the ADA, IDEA, The Fair Housing Act, ect. While these pieces of legislation provide useful means for creating more accessible workplaces, schools and housings, this strategy does not adequately prevent state discrimination in all areas of American life. There remain many state laws that continue to facially discriminate against people with disabilities, limiting rights for voting, marriage, family relations, and other vital areas of personal autonomy. The solution in one view is to litigate these issues with state constitutions and federal laws like the ADA. However, this is not a holistic approach to the problems of discrimination. In fact, this strategy enables significant vulnerabilities to exist that leave open the door for the violation of the rights of people with disabilities.

Among the vulnerabilities concerning civil rights protections for people with disabilities is the lack of adequate protection under the federal Constitution. The federal Constitution provides significant means for disability related federal legislation to be produced, among them the Spending Clause and Commerce Clause, but disability discrimination protections afforded by the 14<sup>th</sup> Amendment's Equal Protection Clause are dramatically inadequate as currently interpreted, especially when compared to protections afforded to other protected groups. Of the three levels of scrutiny applied to discrimination protections for protected classes under the 14<sup>th</sup> Amendment, disability receives the weakest level of protection, dead last behind heightened protections for race and gender discrimination protections.

Disability constitutional law is largely viewed as settled law, with the most significant precedent being *City of Cleburne v. Cleburne Living Center, Inc.*, where the court ruled that, because, among other reasons, disability specific needs may be addressed through varying government services, a more stringent level of protection under the 14<sup>th</sup> Amendment could threaten intervening government services and charity. The Court in *Cleburne* also failed to properly address the history of discrimination people with disabilities have faced, ignoring the fact that relying on the constantly changing legislature for federal protections leaves people with disabilities vulnerable to constantly changing attitudes in the federal and state governments that may violate their rights. To withstand these changing attitudes, the disability community needs strong, long-lasting constitutional protection.

The lack of proper constitutional protections for people with disabilities has kept open the door for states to continue to make laws that plainly and openly discriminate against people with disabilities, especially cognitive disabilities. In the area of institutional commitment and family relations, people with disabilities are regularly discriminated against in such a way that would likely not be permitted if there were a greater degree of constitutional protection. Legal decisions regarding these cases continue to cite *Cleburne* to claim that disability is not a protected class, thereby enabling courts to use the weakest legal test to examine the constitutionality of discrimination cases. The weakest test, known as the rational basis test, minimizes the rights of the disabled individual to give the maximum degree of power to the state, so long as the court finds the legislature's reasoning to be servicing a legitimate government purpose and rationally related to that purpose.

The relationship of people with disabilities to the Equal Protection Clause of the 14th Amendment was most explicitly established by the Supreme Court in *City of Cleburne, Texas v. Cleburne Living Center*. The case in question involved a group of cognitively disabled people who intended to live in a group home in an area where the zoning laws specifically excluded group homes for people with cognitive disabilities (Halfon 15). The case in the Fifth Circuit found cognitive disabilities to be a quasi-suspect class and found the ordinance to violate the Equal Protection Clause because it did not meet the associated test of furthering an important government purpose (Halfon 16). On appeal from the Fifth Circuit, the Supreme Court ruled that because people with cognitive disabilities struggle to function in society and have diverse sets of needs, the rational basis test is the only fitting test that can provide state legislators the flexibility needed to address their complex needs (Halfon 16). This rationale feeds into the difficult relationship established between people with disabilities and their governments enshrined in the progressive movement, that their existence was to be pitied and the detrimental consequences of their lives was to be mitigated by their government. Moreover, the Court reasoned that the host of legislation protecting the education, housing, and employment rights of people with disabilities defeats any constitutional claim that they are a politically powerless minority needing heightened protection (Halfon 16). The Court's final concern was that an elevated level of scrutiny applied to the amount of characteristics that could qualify as some sort of disability would be too broad (Halfon 16). With that in mind, the Court ruled that disability classifications need only meet the rational basis test.

*Cleburne* failed to properly acknowledge the history of discrimination facing people with disabilities in American society. People with disabilities have faced, and continue to face, the limitation of their rights by state laws and the continued applications of erroneous interpretations of constitutional law. While fundamental rights regarding the ability to marry, have children, and raise a family are taken for granted by non disabled citizens, that is not the case for people with disabilities. As I will explore below, the lingering effects of the Eugenics Movement continue to negatively affect public policy and the status of disability constitutional law today.

The foundation of America's relationship to people with disabilities was born in the Progressive movement's Eugenic programs. Throughout the 1800s and 1900s, the forcible practice of sterilization was a very common consequence of being born with a disability (Lou 5). An Indiana law in 1907 was the first piece of legislation to legally authorize the involuntary sterilization of people with disabilities, and by 1930, that practice would have been adopted by 33 states (Lou 5). The practice of involuntary sterilization would continue with the Supreme Court's support in *Buck v. Bell* (Lou 5). This decision has never been officially overruled; instead, the forcible sterilization of people with disabilities has only been outlawed as a result of a hodgepodge of cases that found the sterilization of criminals to be unconstitutional (Lou 7).

The right to privacy in *Roe v. Wade* created another protection against the forcible sterilization of people with disabilities through protecting a right to reproductive privacy, though it was decided by a 5-4 vote and remains a highly contested decision today (Pfeiffer 4). Should *Roe* be overturned, some worry that forced sterilization could again return. Without *Roe*, the remaining precedent provides very weak protections for reproductive privacy (Pfeiffer 4). Should the more liberal decisions regarding sexual privacy be overruled, the Court may accept the reasoning of *Bowers v. Hardwick*, where state police powers authorized local authorities to forcibly enter a residence if sodomy was believed to be performed there (Pfeiffer 4). Without the *Roe* decision or a level of scrutiny above the rational basis test, if the public again becomes enamored with the ideology of the Eugenics Movement there would be a disturbingly weak degree of constitutional protection to shield people with disabilities from a return to involuntary sterilization.

More than a history of discrimination, there are also considerable harmful stereotypes that prevent people with disabilities from achieving substantial economic and political achievement (Pfeiffer 9). A considerable amount of studies exist that argue that disabled people are unable to function in society, but these studies are often limited by their instrumentation methods (Pfeiffer 9). Similar to the ways in which IQ tests have been shown to discriminate based upon race, so too have studies today been shown to create self-fulfilling prophecies that link any variable that expresses lower IQ to the person's disability (Pfeiffer 9). In addition to these studies is the prejudice of the automatic assumption of tragedy (Pfeiffer 9). Non-disabled people frequently worry how awful acquiring a disability would be, and fear that their child is born disabled (Pfeiffer 9).

Society's negative view of people with disabilities is due to its flawed foundational assumptions that can be traced to the 19<sup>th</sup> century. These assumptions were largely influenced by evolutionary biology and seized upon by the Eugenics Movement (Appleman 23). The values driving the genetic basis of the Eugenics movement were largely established through the works of Charles Darwin (Appleman 23). This philosophy developed further through the work of Ronald Fisher, who melded the conflicting theories set forth by divergent followers of Darwin into a more central, focused message (Appleman 23). He undertook a historical analysis that pinned the failure of societies not necessarily on the actions of a government, but rather claimed that the society failed because the "better" classes did not create a greater number of offspring to outnumber the inferior classes (Appleman 23). Therefore, he argued that sterilization be used to limit the number of "defects" born and incentives be imposed to increase the births of the preferred classes (Appleman 23). Still, he stopped short of advocating for forcible sterilization. Instead, he argued that sterilization must be done voluntary out of civic (Appleman 23).

The foundations of Darwin and Fischer created the social attitudes that contribute to an oppressive social and legal structure facing people with disabilities. A key component of this structure sought to segregate people with disabilities into institutions (Appleman 17). The first institution was established for the "defective" and disabled by Samuel Howe in 1849 (Appleman 17). Howe intended to use the institutions to correct the unwanted defections and then return the patients back to society (Appleman 17). However, once people with disabilities had been removed from their home and successfully treated, communities did not want them to return (Howe 18). Institutions then became a depository of places where undesirable members of the communities were forgotten (Appleman 18). Shortly after the first institutions were established, R.L. Dugdale's study *The Jukes* was published in 1877 (Appleman 22). This study examined the home and family of a "degenerate" family known as the Jukes and argued that their struggle was a consequence of their genetic lineage (Appleman 22). This study spurred the further publication of research that examined the living arrangements of "degenerate" families, and ascribed genetic causes to their problems and suffering (Appleman 22).

Studying families through IQ tests confirmed to Eugenacists that their theory of genetically linked inferiority was correct, which then prompted the creation of related policy proposals (Appleman 17). The solution for Eugenacists was then two fold, to 1) prevent the reproduction of disabled people, and 2) segregate them into institutions (Appleman 17). Doing this would not only prevent their reproduction, but prevent the harm Eugenacists believed disabled people caused to the well being of non-disabled people (Appleman 17). A proposal by the prolific eugenicist Harry Laughlin argued for the forcible sterilization of:

"...(1) feeble-minded; (2) insane (including the psychopathic); (3) criminalistic (including the delinquent and wayward); (4) epileptic; (5) inebriate (including drug habitues); (6) diseased (including the tuberculous, the syphilitic, the leprosy, and others with chronic, infectious, and legally segregable diseases); (7) blind (including those with seriously impaired vision); (8) deaf (including those with seriously impaired hearing); (9) deformed (including the crippled); and (10) dependent (including orphans, ne'er-do-wells, the homeless, tramps, and paupers)." (Pfeiffer 16)

The Court's outdated thinking regarding disability in *Cleburne* is rooted in the same problematic socially constructed assumptions that led to infamous state sanctioned policies of racism, sexism, and forced sterilizations of people with disabilities. Just as the Court once "limited women's participation in society on unfounded stereotypes about their biological differences", so too does the court do the same regarding people with disabilities today (Silvers 82). Similarly inaccurate and generalized stereotypes allowing gender discrimination would be found in *Frontiero v. Richardson* to be unconstitutional under the 14th Amendment's Equal Protection Clause (Silvers 82). The Court reasoned that the view that women were genetically disposed to be less able to "perform or contribute to society" was too much of an empirical generalization and had no factual basis (Silvers 82). Similar conclusions were drawn in cases outlawing racial discrimination. However, no such judicial determination has been made regarding disability. Indeed, the decision in *Cleburne* cited a host of concerns regarding "the real and undeniable differences between the retarded and others" and their inability to function in society (*City of Cleburne v. Cleburne Living Center* 8). While some people with cognitive disabilities need extensive services and supports, others do not and function well. Moreover, *Cleburne's* claim that the diverse needs of individuals with cognitive disabilities necessitates a low level of scrutiny is a strange suggestion. Individual members of each class, race, gender, etc have diverse abilities and needs, but the merits of their claim to a higher level of scrutiny is not related to that fact.

While the Court is indeed reluctant to expand the number of groups that may be classified as suspect, it has covertly addressed concerned groups through the expansion of the rational basis test. By analyzing cases utilizing the rational basis test, scholars find that there exists two versions of the rational basis test, "the ordinary rational basis review and rational basis with bite review" (Yoshino 759). In cases following the 1937 *Williamson* decision, the court held that its application of the rational basis test would "uphold state action if it could imagine any possible rationale for the state's action" (Yoshino 760). This would be known as the original rational basis test, and it would defer to the rationale of the state, even if the state did not provide an adequate rationale itself, as long as members of the Court could imagine one (Yoshino 760).

The Court struck down the law at issue in *Cleburne* through what scholars call the rational basis test with bite (Yoshino 760). In *United States Department of Agriculture v. Moreno*, the Court overturned a decision upon the reasoning that the legislation in question reflected a "bare congressional desire to harm a politically unpopular group", and therefore was not a legitimate government interest (Yoshino 760). This is a similar rationale used in *Cleburne* and *Romer v. Evans*, with both cases upholding the sentiment that "if 'equal protection of the laws' is to mean anything, it must at the very least mean that a bare... desire to harm a politically unpopular group cannot constitute a legitimate government interest" (*United States Dept. of Agriculture v. Moreno* 7). The rational basis test with bite is stricter than the typical rational basis test that grants a significant level of autonomy to state legislators. However, the rational basis test with bite as applied by the Supreme Court has not been followed as precedent in lower courts (Yoshino 761). As was the case in *Romer*, the Court applied the rational basis test with bite in *Cleburne* and determined that there was no legitimate government interest in the zoning ordinance that prohibited people with cognitive disabilities from living in a group home in the area. However, because the Court did not adequately define the rational basis test with bite, lower courts continue to apply the original rational basis test in state discrimination cases against people with disabilities (Yoshino 761).

The Supreme Court has given heightened scrutiny to five types of classifications: "race, national origin, alienage, sex, and no marital parentage" (Yoshino 756). All other classifications need only meet the rational basis test, while heightened classes force states to only discriminate upon a criteria if there is an important or compelling government interest (Yoshino 756). While the Equal Protection Doctrines of individual states have been used to add new heightened protected classes to state precedent, it seems that the opportunity to afford new suspect statuses in federal cases may be impossible (Yoshino 757). Some legal scholars attribute the hesitancy of the Court to examine new groups with heightened scrutiny to pluralism anxiety (Yoshino 758). Pluralism anxiety holds that the famous precedent in the *Carolene Products* footnote that argues that the "prejudice against discrete and insular minorities" that calls "for a correspondingly more searching judicial inquiry" would be too large a grant of power for the Court if applied to the number of diverse communities in the United States (Yoshino 758). It was a similar principle of pluralism anxiety that affected the outcome of *Cleburne*, with Justice White writing:

"If the large and amorphous class of the mentally retarded were deemed quasi-suspect... it would be difficult to find a principled way to distinguish a variety of other groups who have perhaps immutable disabilities setting them off from others, who cannot themselves mandate the desired legislative responses, and who can claim some degree of prejudice from at least part of the public at large" (*City of Cleburne v. Cleburne Living Center* 11).



White's argument above is a red herring. One does not need to assume the maximum degree of an inclusive disability category to create any proper definition of disability. Many legislative remedies that afford civil rights protections to people with disabilities contain targeted definitions of people with disabilities. Pluralism anxiety is a legitimate concern, but given the history of people with disabilities in America, particularly the specific nature of the cognitively disabled at issue in *Cleburne*, the Court missed an opportunity to draw a nuanced definition of disability and raise the associated level of scrutiny accordingly.

The Court seriously erred in its *Cleburne* decision to not properly take into account the history of discrimination faced by people with disabilities in the United States. The public intellectuals and scientists shaped an oppressive ideology that manifested itself through the sterilization of people with disabilities, and many of the underlying assumptions continue through the application of *Cleburne*. The practice of forced sterilizations only ceased in the 1970s, and the swaying of public opinion and scientific practice proves to be a danger to the long-term protection of the rights of people with disabilities. Moreover, the looming threats to *Roe v. Wade* threaten the rights of reproductive privacy assured to people with disabilities, and without *Row* little would remain to protect the sexual reproduction rights of people with disabilities. Given these threats and America's longstanding history of discrimination, people with disabilities are entitled to a judicial shield to protect their fundamental rights to bodily integrity. That shield exists within the United States' Equal Protection Clause of the 14th Amendment, and it is time for the Supreme Court to recognize that reality.

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# Attitudes Toward Immigrants: The Impact of Vivid Testimonials vs. Statistics

By:

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## Abstract

The topic of immigration is a politically polarizing issue despite the U.S.A.'s characterization as a post-racial nation-state. In the current research, we tested the hypothesis that people's attitudes about immigration are influenced more by exposure to vivid, emotional stories about an immigrant than by exposure to non-partisan statistics about immigrants. Participants were 369 undergraduate students enrolled at a public, Midwestern university in the U.S.A. In the study, some participants were exposed to a positive story about an undocumented immigrant, some to a negative story, and some to no story at all. In addition, half of the participants in each story condition were exposed to national statistics about immigration through a "Did you know?" quiz, while the other half in each story condition were not exposed to the statistics. Then, all participants reported their attitudes toward immigrants. Data analysis revealed that attitudes towards immigrants were moderate-to-positive regardless of condition, and exposure to the non-partisan statistics had a small, positive effect on attitudes. The current findings suggest that statistics *can* sway attitudes; however, we question whether the findings will replicate in a sample drawn from a more politically and educationally diverse population.

**Keywords:** Immigration, testimony, attitudes, statistics, NATIS

## Introduction

The topic of immigration is a politically polarizing issue, with memes and personal stories being used on both sides to support politicians' views. It also appears that the citizenry of the U.S.A. is divided on the issue (Gramlich 2019), despite the U.S.A.'s self-identified characterization as post-racial and post-segregation. In the current research, our aim is to assess whether people use concrete statistics to guide their views about immigration, or whether they use vivid stories about individual immigrants to guide their views.

There is a substantial literature in the social sciences on attitude formation (Kumkale et al. 2010) which argues that source credibility and motivation to interact with material is most likely to happen when participants lacked prior attitudes and were also seen to be unable to form a new attitude based solely on the content of information. In furthering our understanding of global issues, and in an era where technology is accessed by 76.2% of the U.S.A.'s population, do statistics have the ability to alter a person's perception of immigrants or do people hold personal stories in higher regard for deciding their attitudes? In one key set of studies on the role of stories and statistics conducted in 1980 by Hamill, Nisbett and Wilson the results were clear. In their first study participants who were exposed to a vivid and negative story about *ONE* welfare recipient had more negative attitudes about welfare recipients in general than did two groups who were not presented with a negative story. Beyond the exposure to information about individual cases, participants, on average held moderate-negative attitudes towards welfare recipients (Hamill et al. 1980). This is to say that research on other divisive issues has shown that personal testimonies and being told that such testimony is not representative of the population size did not have significant differences on people's perception of black women on welfare or prison guards (Hamill et al. 1980). In their second study, Hamill et al. accounted for population stereotypes by presenting participants with a story that confirmed stereotypical ideas about prison guards while another group were presented with information that was counter-stereotyped. In the 2 by 3 study, participants who received information were also presented with the typicality of the humaneness of the prison guard. Participants were told whether the participant was typical, atypical or were given no information about the typicality of the prison guards humaneness. In this study, participants recalled the typicality of humaneness in more than 80% of all cases. It is possible that the presentation of information via a video recording as opposed to a magazine excerpt can account for this high recall rate, or, it is possible that

participants did not hold negative attitudes towards prison guards and were therefore only responding to the information given and not to any preconceived biases.

It has been close to 40 years since the Hamill study was conducted, yet biases persist despite our access to technology and statistics continue. In a study done by Varela et al. in 2013, researchers were able to create and validate an attitudes inventory that would help them assess people's attitudes towards immigrants. This inventory documents negative attitudes towards immigrants through higher mean attitudes in response to a series of twelve questions. In terms of interpersonal biases, is there a way in which to present information to persuade negative attitudes towards a marginalized group to become more positive after the presentation of data? Research on interpersonal bias has been completed throughout various social sciences. Studies have shown that white participants generalize negative behaviors of one Black confederate when the confederate is seen as aggressive. Consequently, white participants were also recorded as being avoidant of Black confederates after being primed on the criminality of a single Black person (Henderson-King & Nisbet 1996). These generalizations from a single confederate have been recorded in various other studies that look at interpersonal bias within the social frame of the United States of America (U.S.A.) In viewing what information is being taken in, people have been characterized as "un-influenceable by certain types of logically compelling information and overly influenceable by certain types of logically very weak information" (Nisbett & Borgida 1977). This consumption of information has been documented, however, methodologies like that of Hamill et al. have not yet been replicated using a historically significant issue, such as immigration. Thomas Pettigrew's research on "the ultimate attribution error" has remained a relevant analysis of prejudice when presented with vivid accounts of outgroup members. Pettigrew's research can be summarized as showing that negative attributes of an individual is often generalized as being an accurate portrayal of outgroup members; the same can not be said of positive attributes which are justified as being luck, an exceptional case, or contextually different than other outgroup members (Pettigrew 1979).

As mentioned previously, the presentation of data is not always correlated with a more realistic interpretation of information when also presented with a vivid testimonial (Hamill 1980). In the research completed by Hamill et al., participants who were told the typicality of a vivid testimonial responded in accordance to the vivid testimony and NOT the information presented to them. These generalizations were recorded in situations where participants were informed of typicality and when they were not informed of typicality. Bias in these cases would stem from the generalizations of how information is processed which leads us to further question whether the story presented would be better retained and less generalized if it were positive or negative. Data collected about bias held against outgroup members via attitude inventories must therefore be able to assess attitudes across various different population groups via different nations (Veer et al. 2004).

On the basis of the literature reviewed, we hypothesized that (1) people's attitudes towards immigrants is polarized and mostly negative; and (2) participants' attitudes towards immigrants will be negative regardless of valence of story and/or receiving statistics.

## **Method**

### **Participants**

A total of 387 participants were gathered from undergraduate courses in social sciences departments at the University of Wisconsin-Eau Claire. Using convenience sampling and voluntary class activities, students participated via a paper and pencil questionnaire. After data entry was complete, researchers omitted a total of 18 participants with incomplete data (more than two of the NATIS items left unanswered) or a failed manipulation check. After omissions, the final sample for analysis included 369 participants.

### **Materials and Procedure**

As displayed in Table 1, participants were randomly assigned to one of six research conditions. These conditions were created by the combination of two independent variables. The first independent variable, story, had three levels: Positive Story, Negative Story, and No Story. The second IV, statistics, had two levels: Statistics and No Statistics. All participants reported their demographics and completed an assessment of their attitudes toward immigrants (dependent variable).

**Independent variable I: Story (Positive/Negative/No Story).** Participants in Conditions 1 and 2 were presented with the following positive story:

"Gerardo came to the United States of America, undocumented, when he was 18. Upon arriving to the USA, he enrolled in classes and earned his General Equivalency Diploma (GED). He immediately looked for landscaping work and other manual labor to pay for necessities. Within a couple of years, he established himself as an active member of his local community, where he attended weekly meetings about how to improve the neighborhoods and plan community festivals. After a few years in the USA, Gerardo got married and, with his wife, established a network of community friends who help incoming immigrants assimilate to the local culture. He is now 55 years old and has been working with the same construction company for twelve years. His two children are in high school, and although he has not applied for residency, he has instead saved a good chunk of money to help his children pay for college. Gerardo's English has improved with time and, because of his bilingual skill, he now helps with retention coordination at his construction company."

Table 1  
The Six Conditions in the Study

Condition 1	Condition 2	Condition 3	Condition 4	Condition 5	Condition 6
Positive Story	Positive Story	Negative Story	Negative Story	No Story	No Story
Statistics	No Statistics	Statistics	No Statistics	Statistics	No Statistics

Participants in Conditions 3 and 4 were presented with the following negative story:

“Gerardo came to the United States of America, undocumented, when he was 18. Upon arriving to the USA, he was encouraged to attend classes that would help him earn his General Equivalency Diploma (GED), but he decided not to. He initially relied on selling marijuana to pay for necessities. Within a couple of months, he obtained part-time service jobs, but because of his poor English could not communicate well with others and was forced to work alongside other undocumented Spanish-speaking immigrants. Regardless, he was fired from those positions because of his unreliable work ethic and so continued to sell drugs. The majority of his clients are students from the local high school who he sees walking home after classes. Now, at 21 years old, Gerardo has fathered two children; he is not an active part of either of their lives and is moving from state to state to avoid paying child support to their mother. He asks for government assistance to afford food and shelter, and each month he sends any extra money he makes back to Mexico.”

Regardless of valence of story, participants in Conditions 1 thru 4 were asked whether or not their attention was maintained throughout the small excerpt and also whether or not they would read more articles from the same publisher; responses were recorded on a 9-point scale from “No” to “Yes”. These questions were asked to ensure that participants responded with similar levels of interest to the two stories, and they did, so these questions will not be discussed further.

Participants in Conditions 5 and 6 did not receive any story.

**Independent variable II: Statistics.** Half of the participants who received the positive story (those in Condition 1) and half of the participants who received the negative story (those in Condition 3), and half of those who didn’t read a story at all (those in Condition 5) were presented with true statistics about immigrants in the form of a “Did You Know?” quiz. The quiz contained 10 statistical facts gathered through a non-partisan research organization, Pew. Examples of the statistics are shown below:

Did you know that 3 out of 4 immigrants are lawful immigrants?

Did you know that 1 million immigrants receive lawful permanent resident status in the U.S.A. each year?

Did you know that undocumented immigrants cannot legally receive welfare or Medicare?

We were not interested, primarily, in whether participants answered Yes or No; we used the “quiz” to indirectly provide the participants in these conditions with statistical information about immigrants.

Participants in Conditions 2, 4, and 6 did not receive the statistics via the “Did You Know?” quiz. Participants in Condition 6, as shown in Table 1, were the true control group in the study because they received neither a story nor statistics before the attitude assessment.

**Dependent variable: Attitudes towards immigrants.** The Negative Attitude Towards Immigrant Scale (NATIS) was used to assess participants attitudes towards immigrants (Varela et al., 2013). The scale includes 12 items such as “Immigrants should be given the same rights as native citizens.” and “Immigrants are a threat to national security.” For each statement, participants rated their agreement or disagreement on a five-point scale ranging from strongly disagree to strongly agree. On this scale, higher scores reflect more negative attitudes toward immigrants. In the current sample, this inventory displayed high internal consistency ( $\alpha = .xx$ ).

**Demographics.** Participants were asked to report their: age, sex (as assigned at birth), race/ethnicity, whether they were born in the U.S.A., if they were an international student, and whether or not they were friends with anyone who is an undocumented immigrant.

**Manipulation check: Recall quiz.** At the very end of the questionnaire, participants who were given either a story or statistics via the “Did You Know?” quiz were asked four follow-up questions about the information they had been given. These served to make sure they were paying attention, and participants who responded to one or more incorrectly were omitted from the dataset.

### Data analysis

Data were analyzed using IBM SPSS Statistics 24. Frequency tests, reliability tests, and ANOVA tests were completed to obtain the data presented.

### Results

In the sample as a whole, attitudes towards immigrants were skewed ( $N=369$ ,  $M=2.03$ ,  $SD=0.65$ ), with the vast majority of responses below the midpoint. Graph 1 is a histogram display of participants' composite scores on the Negative Attitude Towards Immigrant Scale (NATIS). The NATIS showed high internal reliability ( $\alpha=.92$ ). On the NATIS, lower scores imply less negative attitudes towards immigrants. Our hypothesis that the overall mean attitude towards immigrants would be negative was not confirmed. There were only a few participants whose score reflected highly negative attitudes towards immigrants.

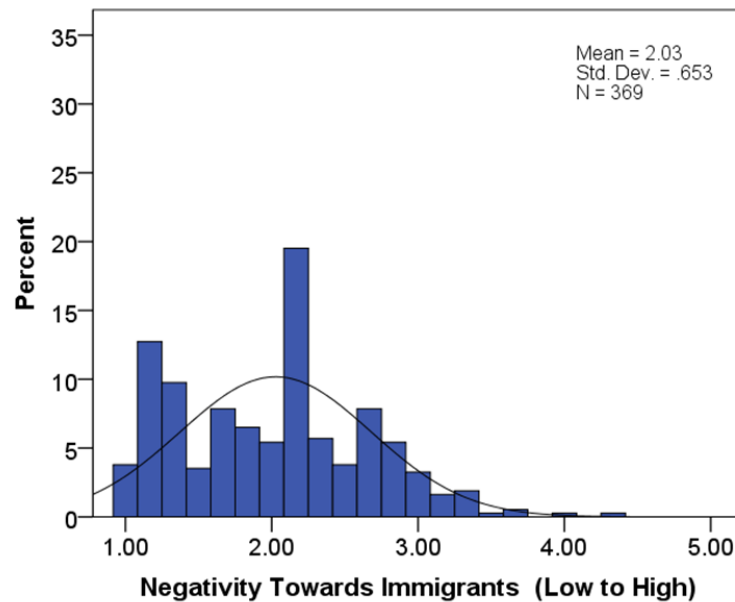


Figure 1. Distribution of mean attitude towards immigrants via NATIS scale.

Our second hypothesis was that exposure to true statistics about immigrants would not affect people's attitudes towards immigrants. In fact, providing statistics had a small negative effect on negativity towards immigrants,  $F(1, 363)=5.55$ ,  $p=.019$ ,  $\eta^2=.02$ . As displayed in Graph 2, those who received statistics had less negative attitudes ( $M=1.95$ ,  $SD=0.62$ ) in comparison to those who did not receive statistics ( $M=2.11$ ,  $SD=0.68$ ). This finding suggests that being presented nonpartisan statistics about immigration may have a small but favorable effect on people's views towards immigrants.

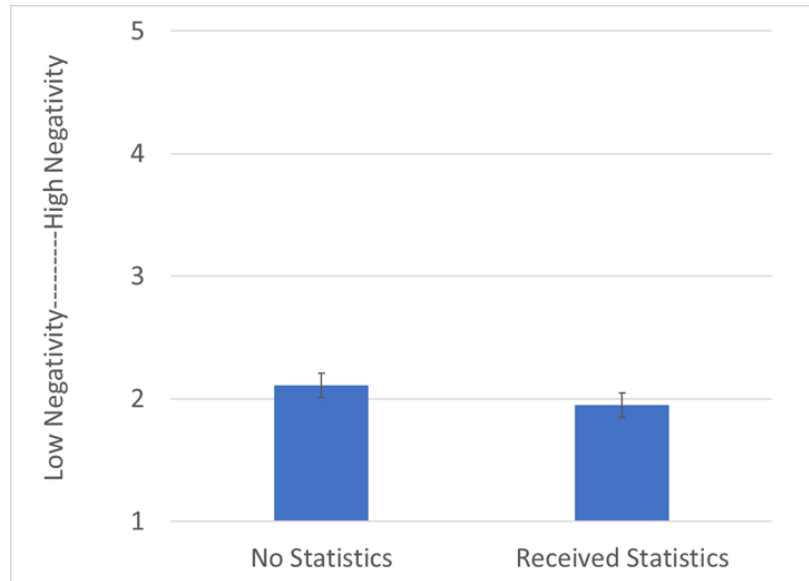


Figure 2. Effect of exposure to statistics on attitudes towards immigrants.

Figure 3 shows that the effect of being presented with statistics only mattered when participants were also given a positive immigrant testimonial. Although there was no overall systematic interaction between valence of story and exposure to statistics ( $F(2, 363)=0.85, p=.426, \eta^2=.00$ ), participants who received statistics in addition to the positive story reported less negative attitudes ( $M=1.88, SD=0.69$ ) than those who received only the positive story ( $M=2.14, SD=0.69$ ). This comparison suggests that being exposed to nonpartisan statistics may have reinforced the positive elements of the positive testimonial and thereby influenced participants attitudes about immigrants. Also as displayed in Figure 3, the negative testimonial did not have a negative effects on attitudes as we predicted it would and the positive testimonial did not have an overall positive effect on attitudes towards immigrants.

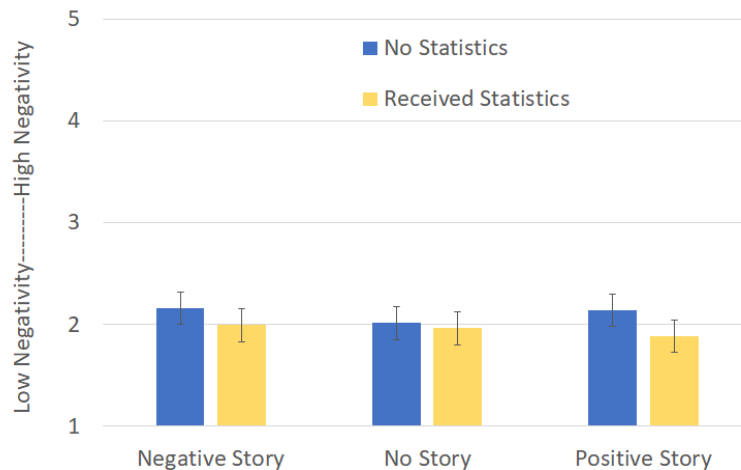


Figure 3. Mean attitude towards immigrants throughout six conditions.

Finally, we looked at how attitudes towards immigrants related to participants responses to the question about whether they had a friend that was an undocumented immigrant. As displayed in Graph 4, participants who reported that they *did not* have an undocumented friend reported more negative attitudes towards immigrants ( $M=2.13, SD=0.67$ ) than those who *did* ( $M=1.85, SD=0.62$ ) or who were *unsure* ( $M=1.86, SD=0.58$ ),  $F(2, 365)=7.89, p<.001, \eta^2=.04$ . Interestingly, participants who were *unsure* held similar attitudes to those who *did* have friends who were undocumented immigrants.

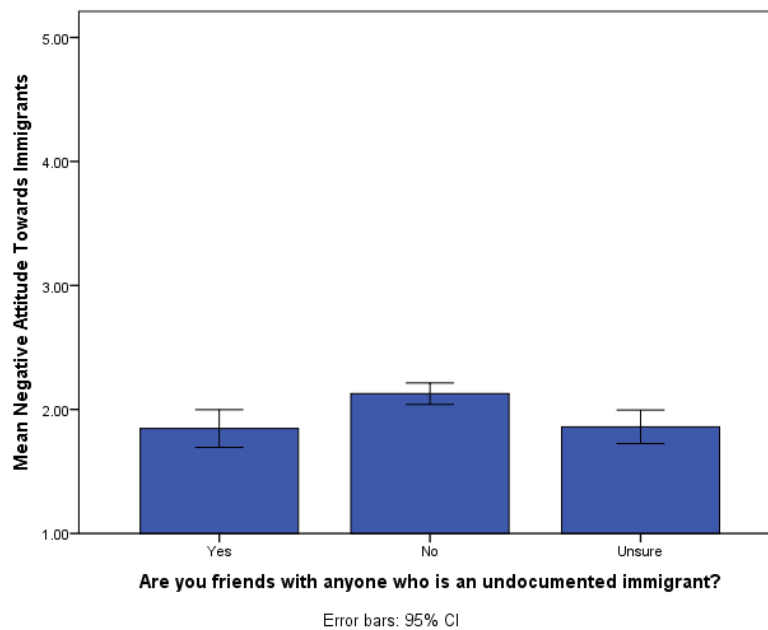


Figure 4. Attitudes towards immigrants as a function of friendship with immigrants.

## Discussion

We designed this study to test the hypotheses that people have negative attitudes towards immigrants and that their attitudes can be swayed to be more positive or more negative through a vivid positive or negative story. Overall, we found that among our college student sample, (1) attitudes towards immigrants were quite positive (2) presenting participants with stories of varying valence had no effect on their attitudes; (3) people's attitudes towards immigrants was most positive when they were presented with statistics [AND] a story with positive valence; and (4) people who did not have any friends of undocumented status (and knew it) had the least positive attitudes toward immigrants. Our finding that attitudes toward immigrants were almost unanimously positive contradicts our original prediction that attitudes would demonstrate polarization that others have suggested is plaguing the United States of America (Pew Research Center 2010). In studies conducted by the Pew Research Center, opinions towards immigration were uniformly favorable if immigration was described as "legal," but opinions varied along party lines when described as "illegal." In our study, we used the term "undocumented," which might partially account for the overall level of positivity in the sample. In terms of presenting participants with statistics, our findings were similar to that of Hamill et. al in that the information presented to participants had little to no effect on their attitude; however, the statistics did seem to help a little when they accompanied the positive story. That is, those who read a positive story along with positive non-partisan statistics had more positive attitudes (or less negative attitudes) than those who only read the positive story. The final research findings, that participants have less negative attitudes towards immigrants when they are personally friends with an undocumented immigrant, are hopeful. They imply that close relationships with people with marginalized identities could have beneficial effects on attitudes towards marginalized identities.

Our findings should be interpreted with caution because our study was not without limitations. First, it is possible that the results are limited to a college demographic. Exposure to evidence-based decision making as well as higher exposure to a culturally diverse environment may influence people's overall attitudes towards immigrants. It is also possible that students who attend our university are uniquely favorable toward our university's strong emphasis on equity, diversity, and inclusion initiatives. Another potential limitation is that participants already held preconceived ideas about immigration and their attitudes are not reflective of which condition they were in but rather previous conceptions about the topic of immigration. Finally, the explanation behind our positive link between immigration attitudes and friendships with immigrants is unclear. Perhaps participants who hold less negative attitudes towards immigrants seek out friends who are undocumented compared to their peers who were certain about not having any undocumented friends; another possibility is that people who meet and get to know an undocumented individual may subsequently change their opinion towards immigration.

Future studies might work to extend our study design as well as address limitations of our study. For example, future research might consider conducting research on the general population, where ages, social rearing, education levels, and political attitudes vary far more than in our liberal college student sample. In such a study, attitudes towards immigrants may be more negative but also more susceptible to the influence of a vivid story -- either positive or negative. Another direction might be to simultaneously track changes

in students' attitudes toward diverse others (including immigrants) and changes in their friendship networks over four years of college, to see whether change in one dimension (e.g., expanding social networks) precedes change in the other (more positive attitudes toward diverse others and inclusion).

### Conclusion

In conclusion, our data suggest that overall attitudes towards immigrants are not as negative as they are portrayed in the media. For example, out of 369 participants, the average mean attitude towards immigrants was below the neutral score of three with very few responses above three. Participants who were presented with stories varying in valence responded similarly regardless of valence. Thus, one take-away message is that people's attitudes towards immigrants on college campuses is not as negative as people might assume based on what they hear on the news about attitude polarization in the U.S.A. Our data also suggest that having friendships with people who are undocumented may be either a cause or consequence of positive attitudes towards immigrants. A key take-away, therefore, is to bridge the gap between others and aim to have friends of varying experiences that may be different from your own. While this may be difficult for some, the ability to make connections beyond our in-group is far easier when we realize we are complex human beings that cannot be categorized in the simplicity of black and white categories.

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## College Students' Experiences with Stress, Coping Mechanisms, and Awareness of the Physical Effects of Stress

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### Abstract

We have long known that the mind and body are closely linked and affect each other. Stress has been associated with negative consequences in each body system, including the endocrine, reproductive, and gastrointestinal systems (Tovian et al., 2018). College students have stressors that are unique to their life stage (e.g., career decisions, identity development) and may be especially vulnerable to the potential mental and physical health consequences (Hayman, Lucas, & Porcerelli, 2014; Hintz, Frazier, & Meredith, 2015). These health behaviors can exacerbate any mental health (e.g., anxiety or depression) or physical health (e.g., headaches or stomachaches) conditions. This study expands the research on the connection between stress and health by examining college students' knowledge of psychosomatic illnesses. Using a survey methodology, over 400 college students were asked about their experiences with stress (measured by the Perceived Stress Scale, 1983), health symptoms (Brief Symptom Inventory, 1975), and their coping mechanisms (Coping Inventory for Stressful Situations [CISS-21], 1999). Additionally, students were asked to rate their awareness of the associations between stress and physical health symptoms. I hypothesized that students who reported more stress and more physical health symptoms will have a better understanding of the psychosomatic connection, as well as more adaptive coping strategies. Results indicated that students who reported more stress were more aware of the effects of stress ( $r = .178, p = .000$ ), more likely to practice avoidance coping ( $r = .138, p < .001$ ), and were more likely to experience somatic symptoms ( $r = .336, p = .000$ ).

Stressful life events are inevitable. It is how we interpret and manage those events that determines the impact that they have on our bodies. Stress has been linked to negative consequences in each system in our body, including the endocrine, reproductive, gastrointestinal, and cardiovascular systems (Tovian et al., 2018). Researchers have studied these physical impacts of stress in various populations, including children, adults, and college students. College students have particular stressors that are unique to their life stage and can lead to potential mental and physical health consequences (Hayman, Lucas, & Porcerelli, 2014; Hintz, Frazier, & Meredith, 2015). College students also report exercising less frequently, eating less healthy foods, and eating more junk foods (Hintz, Frazier, & Meredith, 2015). These health behaviors can influence their mental health (e.g., anxiety or depression) and physical health (e.g., headaches or stomachaches).

Stress can be acute, meaning short-term, or chronic, indicating long-term, although the duration of the stress does not indicate severity. According to Baum (1990), stress is an emotional situation that results in predictable, physiological changes (as cited by the American Psychological Association [APA]). For the purposes of this research study, my definition of psychological stress will be when the threat that one perceives in a situation exceeds their coping abilities (Gianaros & Wager, 2015).

Due to the potential impact that stress can have on the body, being able to reliably measure and predict it can be life-saving. Stress can be measured in a multitude of ways, including through physiological biomarkers, psychological instruments (e.g., cortisol levels, thyroid levels), or self-report checklists.

### Perceived Stress

The significance of exercise for physical and mental health has been well documented. According to the American College of Sports Medicine and the Centers for Disease Control and Prevention, adults between the ages of 18- and 65-years old need moderate aerobic physical activity for at least 30 minutes five days a week or vigorous physical activity for at least 20 minutes three days a week. Exercising regularly can increase an individual's muscular strength, lower one's risk for illnesses like cardiovascular disease, and improve skeletal health (Haskell et al., 2007). Physical activity has also been reported to reduce depression and anxiety levels (McKercher, Schmidt, Sanderson, Patton, Dwyer, & Venn, 2009; Pickett, Yardley, & Kendrick, 2012).

Despite the physical and mental benefits of regular exercise, numerous studies have reported decreasing levels of physical activity with age. Females and certain racial and ethnic groups (i.e., Black adolescent females) report less physical activity than males and other racial or ethnic groups (i.e., White adolescent males) (VanKim & Nelson, 2013). Therefore, worse health outcomes often result for the populations who are not exercising as recommended. VanKim and Nelson (2013) studied the physical health, mental health, and perceived stress of college students. They also measured socializing as a mediating factor, with students reporting the number of close friends (5+ or fewer than 5 friends) and hours/day spent socializing with their friends (2+ or fewer than 2 hours).

They found that students who reported meeting the American College of Sports Medicine and the CDCP's physical activity standards had better mental health and lower perceived stress. Additionally, they found that socializing partially mediated the relationships among physical activity, mental health, physical activity, and perceived stress (VanKim & Nelson, 2013).

Perceived stress can influence physical and mental health and can be caused by multiple factors, including lack of sleep (Hagger, 2010). Higher levels of perceived stress are linked to higher depressive symptoms, worse overall health, lower mental health, and increased cortisol levels (Hintz, Frazier, & Meredith, 2015; Leppink, Odlaug, Lust, Christenson, & Grant, 2016; Sladek, Doane, Luecken, & Eisenberg, 2016). Another study looked at the connections between perceived stress and night eating among college students. Researchers measured perceived stress, night eating, and coping mechanisms. They found a positive relationship between stress levels and night eating, meaning that the more stressed a student felt, the more they night ate. (Wichianson, Bughi, Unger, Spruijt, & Nguyen-Rodriquez, 2009). Additionally, results suggested that adaptive coping was found to have a moderating effect on the relationship between perceived stress and night eating symptoms. Students who experience stress and report use adaptive coping strategies typically report less night eating, which can be harmful for a balanced diet.

### **Coping Mechanisms**

Coping strategies can be either helpful or not helpful, depending on the individual and their situation. Folkman (2013) and Folkman and Moskowitz (2000) described coping mechanisms as those that individuals utilize to maintain peace during stressful experiences and can be helpful or negative and internal or external (as cited by Cohen-Louck & Ben-David, 2017).

Maladaptive coping mechanisms, typically considered emotion-focused (e.g., avoiding the situation, drinking alcohol), can increase susceptibility of disease, decrease physical health, and increase mental health symptoms. While emotion regulation can be a protective factor, such as when acknowledging the emotions that are being felt, avoidance is a common emotional response which can harm an individual's mental and physical health. For example, studies have shown that poor emotion regulation can increase levels of anxiety and depression (Man-Ging, Frick, & Baumann, 2018). Additionally, maladaptive coping mechanisms can affect physical health, such as suppressing immune system function (Marcks & Woods, 2005).

On the other hand, coping mechanisms can be extremely helpful in stressful situations (Darling, McWey, Howard, & Olmstead, 2007). Adaptive coping mechanisms, typically considered problem-focused (e.g., working through the situation to find solution, seeking out advice from others), are protective to health (Holton, Barry, and Chaney, 2016). These coping strategies can lead to lower stress levels, lower susceptibility of disease, and increased mental health. For example, studies have shown that exercising can improve mental health as well as physical health by alleviating stress and worries, and increasing mental well-being (Burg et al., 2017). Coping mechanisms can be internal (e.g., emotion regulation or self-efficacy) or external (e.g., regular exercise, socializing). As discussed earlier, VanKim and Nelson (2013) found that socializing played a mediating role between physical activity and two factors: mental health and perceived stress. Physical activity has been linked to lower stress levels, lower reports of depression, and increased mood. This coping strategy can increase resilience against the multitude of stressful events college students face. Studies have suggested programs for universities and colleges to teach effective and adaptive coping strategies for this purpose.

### **Physical Health**

Another factor correlated to stress and coping is physical health. Many studies focus on the mental health impacts of stress (e.g., anxiety and depression) rather than on the physical health impacts of stress (e.g., headaches or stomach pain). The role of physical health may be related to race, as has been studied by researchers for some time. Belgrave, Molock, Kelley, and Nana-Sinham (1991) reported the differences between African Americans and Whites pertaining to health. Blacks are at a disproportionately higher rate of any health outcome, and they report significantly worse health than Whites do in America.

Research has determined a link between the mind and body, especially relating to stress effects on health. Gianaros and Wager (2015) discussed the impact that neuroimaging has allowed for in finding biological pathways of stress. They also discussed the primary and secondary appraisal systems that play key roles in our ability to detect perceived stress and danger. Similarly, Cohen, Gianaros, and Manuck (2016) reported on the three traditional ways of studying stress: epidemiologic, psychological, and biological. However, they diagram a heuristic model that seems most effective in studying stress impacts on the body. For example, the model includes an environmental demand (i.e., stressor) leading to a demanded appraisal (i.e., perceived stress), causing a negative emotional response. From there, the response can lead to either poor health decisions/behaviors and an activation of the HPA (hypothalamic-pituitary-adrenal) axis which causes physiological changes in the body. The hypothalamus, a small part of the brain that is responsible for maintaining homeostasis, signals the pituitary and adrenal glands which release stress hormones (e.g., cortisol and epinephrine). The liver is also activated and begins producing more glucose, which is okay for the average individual because it can be reabsorbed into our bodies. The excess glucose production can be harmful for individuals more susceptible to Type II diabetes, such as individuals who are obese or part of specific ethnic groups (Native Americans; Tovian et al., 2018). Eventually, the over-activation of the HPA axis can increase the risk of disease or onset of disease progression (Cohen, Gianaros, & Manuck, 2016).

While the aforementioned studies have looked at many important variables, including perceived stress levels, physical health, and coping strategies of college students, there are other variables that likely play a role in stress experiences. One variable that I am

interested in is the awareness of stress impacts on the body. Few, if any, researchers have measured college students' awareness of the physical manifestations of stress and, consequently, we know little about their knowledge of the impact of stress on the body. By measuring individuals' awareness, researchers can determine whether having knowledge on this topic is related to the levels of stress that students feel, types of coping mechanisms, and consequential physical health.

## Method

### Participants

The researchers recruited participants through the University of Wisconsin-Eau Claire (UWEC) psychology study portal (SONA) where students can get extra credit for participating. Before cleaning the data file, we had 487 participants. After removing participants for not being currently enrolled at UWEC, completing a majority of the study, or indicating that they did not respond to the questions honestly, our sample included 481 participants.

Most participants were White (90.3%), followed by Asian (4.1%), Hispanic (1.7%), Black or African American (0.6%), and the remainder did not indicate an ethnicity. This is comparable to other predominantly White institutions, such as UWEC. Most participants were female (83.4%) with 14.9% male, 1 participant indicated nonbinary and 1 participant indicated demi boy. Most participants were born in 2000 (N=193), 1999 (N=152), and 1998 (N=49). This is logical based on traditional college students and that most were, presumably, in an intro psychology or similar course. Most participants reported a family income of \$50,000-\$80,000 (27.6%) followed by greater than \$100,000 (25.8%). These findings are typical of research conducted in the U.S. and other Western nations (Henrich, Heine, & Norenzayan, 2010).

### Materials

The Perceived Stress Scale (PSS; Cohen, 1983) examines the amount of stress that participants have experienced in the last month. A score of 1 = Never, 2 = Almost Never, 3 = Sometimes, 4 = Fairly Often, and 5 = Very Often. The answers for items 4 ("how often have you felt confident about your ability to handle your personal problems"), 5 ("how often have you felt that things were going your way"), 7 ("how often have you been able to control irritations in your life"), & 8 ("how often have you felt that you were on top of things") were reverse scored and then each of the scores were summed for a total score.

The Brief Symptom Inventory (BSI; Derogatis, 1975) is a self-report measure for clinically relevant psychological symptoms in adolescents and/or adults. The 53-item covers nine categories of health: somatization, obsession-compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. Also, it covers three global indices of distress: Global Severity Index, Positive Symptom Distress Index, and Positive Symptom Total. However, for the purposes of this study, I only analyzed the data from the somatization scale of health. The participants ranked how distressed they were by each item on a 5-point Likert scale from 0 (Not at All) to 4 (Extremely) during the past 7 days (e.g., pains in the heart or chest, nausea or upset stomach).

The Coping Inventory for Stressful Situations (CISS-21; Endler & Parker, 1999) allowed the researcher to measure participants' likelihood of utilizing various strategies to handle stress. The coping mechanisms are split into either task-oriented (e.g., focus on the problem and see how I can solve it), emotion-oriented (e.g., focus on my general inadequacies), or avoidance coping (e.g., buy myself something). The researchers changed the response choices to include a 5-point Likert scale of 1 = Never to 5 = Very Often. Calsbeek, Rijken, van BergHenegouwen, and Dekker's (2003) results indicate that the coping method of *take some time off and get away from the situation* be removed from the avoidance coping scale in adolescent and young adult samples so I did not include it in my analyses.

The researcher was unable to find a measurement that assessed individuals' awareness of the relationship between stress and the physical effects of stress. After an extensive literature review, one was created for the purposes of this study based on the APA website (2018). Seven questions had participants rank their level of agreement on a 6-Point Likert scale, where 1 = Strongly Disagree, 2 = Disagree, 3 = Slightly Disagree, 4 = Slightly Agree, 5 = Agree, and 6 = Strongly Agree, of the impact on various sections of the body (e.g., my stress levels can impact my cardiovascular system).

The reaction measure consisted of 8 questions that asked the participants about their experience with the study (Peden and Tiry, 2013). Scores range from 8 to 40. The highest score indicates the participants' dislike or issues with the study; the lowest score indicates the participants' like or lack of issues with the study. The last question allowed participants to contribute any comments, suggestions, or questions that they had about the study.

### Procedure

The researcher and mentor employed a comprehensive literature review in the spring and summer of 2018 to find appropriate measurements. Due to the novelty of the awareness variable, a measurement was created that is based on the American Psychology Association's website (Tovian, et al., 2018). In October 2018, the researcher submitted an IRB proposal for the study and received feedback on minimal alterations. In November 2018, the Qualtrics study was launched on SONA for two weeks and two days, until we believed that there were enough participants to hold statistical power after data cleaning (N = 487).

The study consisted of an introduction, demographic questions, the PSS, the BSI, the CISS-21, psychosomatic awareness measurements, and reaction blocks. The psychosomatic awareness measurements measured first the participants' own awareness by having them rate on a 6-point Likert scale how much they agreed that stress could impact various systems in their body. Then, they were given the same questions but asked to consider how much they thought that other students their own age knew that stress impacted these systems on a scale from 0 = Not at All to 4 = To a Great Extent. Because the researcher is most interested in the individual's awareness, the second questionnaire for peers was not analyzed.

The reaction section asked the participants questions about their experience with the study. It asked about the participants' honesty, emotions, and if they gained anything from the study. Participants had the opportunity to make a comment afterwards, too. Debriefing ended the study, describing the purpose of our questions and what we were measuring.

Researchers used SPSS to recode some of the variables into numeric formats and then conducted appropriate statistical analyses. We adhered to the rules of the APA ethics code in that we kept data anonymous, had informed consent, debriefed the participants, and gave them resources to learn more or to ask the researchers questions (APA, 2010).

### Results

Overall, students reported feeling nervous and "stressed" over the past month very often (37.7%), fairly often (37.5%), sometimes (21.7%), and only 2.5% reported almost never feeling stressed. Participants mostly indicated not at all experiencing somatic symptoms in the last 7 days, such as for pains in the heart or chest (62.3%), nausea or upset stomach (44.3%), trouble getting your breath (61.7%), hot or cold spells (58.0%), numbness or tingling in the body (72.7%), and feeling weak in parts of the body (54.9%).

Students who reported more stress were more aware of the psychosomatic relationships ( $r = .178, p = .000$ ), more likely to utilize avoidance coping methods ( $r = .138, p < .01$ ), more likely to utilize emotion-oriented coping methods ( $r = .498, p = .000$ ), and experiencing more somatic symptoms ( $r = .336, p = .000$ ).

Students who reported being more aware of the psychosomatic relationship were more likely to utilize emotion-oriented coping methods ( $r = .191, p = .000$ ) and more likely to experience somatic symptoms ( $r = .242, p = .000$ ).

Students who reported utilizing more task-oriented coping methods were more likely to utilize avoidance coping methods ( $r = .239, p = .000$ ), less likely to utilize emotion-oriented coping methods ( $r = -.229, p = .000$ ), and less likely to report somatic symptoms ( $r = -.113, p < .05$ ).

Students who reported utilizing more emotion-oriented coping methods reported more somatic symptoms ( $r = .401, p = .000$ ). Figure 1 shows the means, standard deviations, and ranges for the measures that participants took. Figure 2 is a correlation matrix showing the relationships between the PSS, BSI, CISS-21 (and subscales), and the stress awareness measurement.

### Discussion

Most students felt nervous or "stressed" within the last thirty days and overall experienced few somatic symptoms over the last 7 days. Again, my hypothesis is that students who report experiencing more stress and more physical and mental health symptoms will have more awareness of the relationship between stress and the physical body, and consequently, more adaptive coping mechanisms. I also believe the opposite to be true: students who report less stress and less physical/mental health symptoms will have less awareness and less adaptive coping mechanisms. My hypothesis that students who report more stress would be more aware of the relationship between stress and physical health was supported. However, participants who reported more stress and more awareness reported using worse coping mechanisms, which is the opposite of my hypothesis.

Figure 1

MEASURE	MEAN	SD	RANGE
PSS	32.49	3.22	10-50
SAS	5.17	1.17	1-7
BSI_SOMA	11.79	4.86	7-42
CISS_TASK	3.26	0.66	1-5
CISS_AVOID	3.12	0.71	1-5
CISS_EMOTION	3.05	0.74	1-5

Figure 2

	PSS	CISS-T	CISS-A	CISS-E	BSI_Soma	SAS
<i>Perceived Stress Scale (PSS)</i>		-0.083	0.138**	0.498**	0.336**	0.178**
<i>Coping Inventory for Stressful Situations_Task Oriented (CISS-T)</i>	-0.083		0.239**	-0.229**	-0.113**	0.037
<i>Coping Inventory for Stressful Situations_Avoidance (CISS-A)</i>	0.138**	0.239**		0.48	0.030	0.077
<i>Coping Inventory for Stressful Situations_Emotion Oriented (CISS-E)</i>	0.498**	-0.229**	0.48		0.401**	0.191**
<i>Brief Symptom Inventory_Somatization (BSI_Soma)</i>	0.336**	-0.113*	0.030	0.401**		0.242**
<i>Stress Awareness Scale (SAS)</i>	0.178**	0.037	0.077	0.191**	0.242**	
* p < .05						
** p < .01						

Almost all the participants reported answering questions honestly (98.5%). The participants who answered “disagree” or “strongly disagree” to answering honestly were removed from the analyses. This is a control check used to ensure that participants are also paying attention to the questions.

Implications for this study include the necessity for future research into awareness of the physical effects of stress. Limitations thus far include having self-report data collection, no established measurement for awareness of psychosomatic symptoms, and extremely limited sample size. Although we had 481 participants, only UWEC students who were active on SONA during the two-week period were able to participate. Our results cannot generalize further than the sample that we have collected, which is mostly White, upper class, female UWEC students. Presumably, because many of the students identified as freshmen, and SONA is a psychology research portal, it is likely that most of the students were in a general psychology courses, such as Psychology 100. Further research should look to expand this to other college students who are not WEIRD and consider the various cultural, ethnic, and environmental factors that influence physical and mental health.

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## Billboards and Farmland: Semiotic Analyzation of Western Wisconsin's Landscape in terms of Welcoming Values

By:

**Carissa Dowden**

Mentor: Dr. Paul Kaldjian

### Abstract

Along a given automobile landscape, individuals are exposed to certain messages, including but not limited to government signs, privately funded advertisements, and temporary or handmade signs. However, these messages convey underlying values, which theoretically relate back to an adjacent community or neighborhood. Building on concepts of welcomingness from “‘Is Tolerant Good Enough?’ Eau Claire and the Practice of Welcomingness,” this project analyzes and evaluates these messages shared on the driven landscape for welcoming (or unwelcoming) values. In order to analyze signs, photos were taken from a car’s perspective on local highways or roads, with a 25-mile route calculated to a specific point in Eau Claire determined by Google Maps. These images were evaluated through a qualitative semiotic landscape analysis of advertisement visuals, textual messages, and overall cultural meaning. Analysis of road messages suggest that the hypothesis is partially supported in more affluent communities, but poor or rural communities are often excluded, as most advertising space is bought by more affluent corporations for capitalistic reasons (therefore having little relation to the thoughts and opinions of locals).

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### Introduction

A Semiotic Landscape refers to “any (public) space with visible inscription made through deliberate human intervention and meaning making.”<sup>i</sup> Therefore, any landscape where humans have created some sort of meaningful image or sign, is a semiotic landscape, and can be interpreted through a visual semiotic framework and a semiotic landscape analysis.

As defined previously in “‘Is Tolerant Good Enough?’ Eau Claire and the Practice of Welcomingness,” welcoming places are where people feel they belong, have a stake and say, and don’t feel threatened.<sup>ii</sup> Researchers interviewed local government and non-profit representatives in Eau Claire concerning their experiences with and perceptions of welcomingness in the community, particularly towards immigrants to the area. Interview responses showed a general lack of consensus on what made Eau Claire a welcoming community to immigrants. For example, Chart 1 shows responses to Question 2 of this research, and there is a significant portion of individuals who feel that Eau Claire is only immigrant-friendly “To Some Extent,” rather than a straight “yes” or “no.” Answers varied from Eau Claire not being “perfect,” to there not being enough resources to help those in need. When deciding on policies or events to create a welcoming community atmosphere, starting on a foot of uncertainty as to where change needs to happen

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<sup>i</sup> Adam Jaworski and Crispin Thurlow, eds. *Semiotic Landscapes : Language, Image, Space*. London: Bloomsbury Publishing PLC, 2010. Accessed April 8, 2019. ProQuest Ebook Central, 2.

<sup>ii</sup> Carissa Dowden et al., “‘Is Tolerant Good Enough?’ Eau Claire and the Practice of Welcomingness” (Poster Presentation), *Celebration of Excellence for Research and Creative Activity 2017*, May 2017, accessed March 19, 2019, <https://minds.wisconsin.edu/bitstream/handle/1793/78022/DowdenSpr17.pdf?sequence=2&isAllowed=y>.



does not typically yield success. Continuation of this research resulted in questions of looking just outside Eau Claire: could welcomingness be viewed on the landscape? Could signs be interpreted as messages of inclusion or exclusion? This project seeks to analyze and evaluate messages shared on the driven landscape for welcoming (or unwelcoming) values, as signs on the landscape theoretically relate back to the values of an adjacent community or neighborhood. Inspired by cultural landscapes studies of the 1970s like Donald W. Meinig and Peirce Lewis, this research seeks to add to the literature on semiotic and linguistic landscapes.

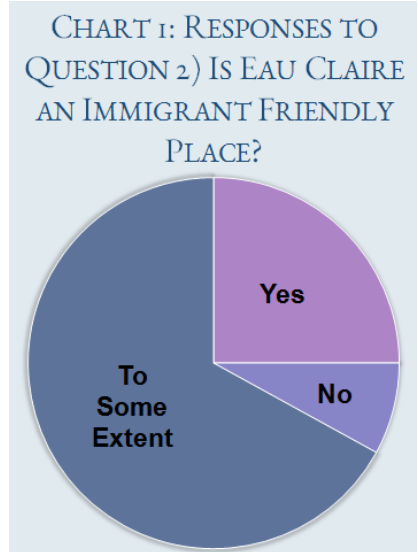
This study was completed during the months of July and August of 2018. As this research relied on site-specific data, many of the signs analyzed as a part of this study have since been replaced by new advertisements. Like other types of human landscapes, semiotic landscapes are continually changing, and can represent an interesting snapshot into a community consciousness.

### Literature Review

This research is inspired by the 1970s cultural geography works of Donald W. Meinig and Peirce K. Lewis. Meinig wrote the article "The Beholding Eye: Ten Versions of the Same Scene" in 1979 for *The Interpretation of Ordinary Landscapes: Geographical Essays*, edited by both Meinig and John Brinckerhoff Jackson. In this article, Meinig explains why people have different perceptions about the landscape, as to him, a landscape is "composed of not only what lies before our eyes but what lies within our heads."<sup>iii</sup> One's perceptions are formed by our experiences and backgrounds, so therefore, how one views the landscape is extremely unique to the individual. Lewis wrote the article "Axioms for Reading the Landscape" in 1982, and states that "all human landscaping has some type of meaning no matter how simple it may be."<sup>iv</sup> This follows Meinig's thesis, as the perceptual landscape comes from the meaning that humans ascribe to it. To apply this concept to Eau Claire, if our view of the landscape comes from experiences and that all landscape has meaning, and to continue the ideas explored in "Is Tolerant Good Enough?" Eau Claire and the Practice of Welcomingness," could one interpret the messages expressed on the landscape for welcoming values? Are there welcoming and unwelcoming landscapes in and around Eau Claire? By adding in semiotic landscape theory, one could semiotically analyze the messages expressed on the driven landscape around Eau Claire for welcoming or unwelcoming values, as theoretically, these messages would relate back to the adjacent community.

Along with Lewis and Meinig, Yi-Fu Tuan is a very important humanistic and cultural geographer whose work also forms a basis for much of the ideas researched in this project. Tuan's *Topophilia: a Study of Environmental Perception, Attitudes, and Values* explores the links between one's environment and world view through the concept of "topophilia," or the "affective bond between people and place or setting."<sup>v</sup> People's sense of place (their interpretation about what "truth" is on the landscape) is shaped by their cultural history and experience in the context of the environment, as well as one's total life experiences and outlook.<sup>vi</sup> As much of Semiotic Landscape ("SL") research is based on interpreting the meaning behind signs, this research adds a humanistic geographic edge to SL in the form of sense of place studies. In continuation of his sense of place research, in his 2001 book *Space and Place: The Perspective of Experience*, Tuan looks at the ways in which people form their sense of space, attachments to their home, neighborhood, and nation, and how their feelings about space and place are affected by the sense of time.<sup>vii</sup> Therefore, in terms of a particular city like Eau Claire, one's interpretation of a landscape and its messages are highly individualized.

The field of SL has its basis in Linguistic Landscapes ("LL"). According to Rodrigue Landry and Richard Y. Bourhis in "Linguistic Landscape and Ethnolinguistic Vitality: An Empirical Study," the term "linguistic landscape refers to the visibility and salience of languages on public and commercial signs in a given territory or region."<sup>viii</sup> While this study specifically looked at multilingual communities like Montréal and the cultural power in the language of signs on the landscape, the same concept can be



<sup>iii</sup> Donald W. Meinig, "The Beholding Eye: Ten Versions of the Same Scene." In *The Interpretation of Ordinary Landscapes: Geographical Essays*, edited by D. W. Meinig and John Brinckerhoff Jackson (New York: Oxford University Press, 1979), 33.

<sup>iv</sup> Peirce K. Lewis, "Axioms for Reading the Landscape." In *Material Culture Studies in America*, edited by Thomas J. Schlereth (Nashville: American Association for State and Local History, 1982) 174.

<sup>v</sup> Yi-Fu Tuan, *Topophilia: a Study of Environmental Perception, Attitudes, and Values*. New York: Columbia University Press, 1990.

<sup>vi</sup> Tuan, *Topophilia: a Study of Environmental Perception, Attitudes, and Values*, 59-61.

<sup>vii</sup> Tuan, Yi-Fu, *Space and Place: The Perspective of Experience*. Minneapolis: University of Minnesota Press, 2001.

<sup>viii</sup> Rodrigue Landry and Richard Y. Bourhis, "Linguistic Landscape and Ethnolinguistic Vitality: An Empirical Study," *Journal of Language and Social Psychology* 16, no. 1 (March 1997): 24.



applied to primarily monolingual communities like Eau Claire in more general analyses. In relation to this idea of visibility and salience of languages on the landscape, Ron Scollon and Suzie Wong Scollon explain how we communicate with signs on the landscape. *Discourses in Place: Language in the Material World* is written about “geosemiotics,” or the study of the social meaning of the physical placement of signs and their discourses, as well as our actions in the same sphere.<sup>ix</sup> While the telegraphic language of a sign is also important, its physical placement and location shapes the message as a whole (e.g. a “traffic light out of order sign,” but is located pointing away from an automobile’s perspective). Scollon and Scollon also discuss the use of language in physical representations, e.g. the material of a posted sign showing its longevity, which is useful in considering the multi-media expression of landscape messages. Scollon and Scollon’s concept of geosemiotics underlies the thesis of this SL research.

Adam Jaworski and Crispin Thurlow’s edited collection of essays *Semiotic Landscapes: Language, Image, Space* is very much based in the ideas written in *Discourses in Place*, but also expand upon how and why meaning is generated from specific landscapes, as well as placing the meaning making within “an interdisciplinary and thoroughly modern cross-section of global trends.”<sup>x</sup> That is, Jaworski and Thurlow are primarily concerned with how language, visual discourse, and the spatial practices of culture interact, especially in the construction of place and the use of space as a maker of meaning. SL research utilizes site-specific research rather than questionnaire data, as is often employed in qualitative research, as the location of a sign is just as important as the language written on it.<sup>xi</sup>

In terms of methodology, Monica Barni and Carla Bagna outline a simple 3-step process for analyzing LL: data collection, initial categorization, and final processing and analyzation.<sup>xii</sup> This also is followed by Victoria Kerry’s research on the semiotic landscape of a CrossFit gym, particularly in the construction of hegemonic masculinity within a confined environment, which also offers a different perspective on the use of LL and SL analysis.<sup>xiii</sup> While it takes place in an indoor environment, Kerry’s research also inspires much of the process for the outdoor-based project, as her paper offers a detailed and structured SL methodology to follow.

Generally, SL studies are continuing to grow, but as of April 2019, it is not common to conduct a critical SL analysis on a specific aspect of a landscape. Previous authors have introduced the type of analysis, laid out the basic steps, and offered supplementary information concerning sense of place within a landscape, but there is still a lack of research in the combined arena. Going into the current political future in the United States, such analyses are valuable in inclusion studies and community development. However, this study only concerns a specific region, and therefore more studies of other communities are necessary to understand the geographic manifestations of welcomingness on the landscape.

## Methodology

Scollon and Scollon’s *Discourse in Place* represents important work in visual semiotics, of which icons, indexes, symbols and “the interaction order” form the basis for SL. To start, we signal our meanings to others via icons, indexes, and symbols.<sup>xiv</sup> For example, a sign can resemble an object (icon), it can indicate or be connected with the object (index), or it can be somewhat associated with the object (symbol). Sense of time, perceptual spaces, interpersonal distances, and personal fronts are resources through which humans interact with the world, and make up what is called the “interaction order.”<sup>xv</sup> These four concepts come together in Scollon and Scollon’s “visual semiotics,” which essentially analyze how images represent the real world.<sup>xvi</sup>

In contrast to traditional LL and SL research, this study does not consider the use of different languages on the landscape, but still looks at the denotation, or the literal meaning of words, and connotation, or the emotional and imaginative association of a word, of signs shared on the landscape within a discourse of power relations between groups.<sup>xvii</sup> Furthermore, this study considers only non-governmental signage, that is, privately-funded and/or erected signage, in the study area. For the sake of this project, privately-funded signage is defined as anything non-governmental written or posted on the landscape for the uses of this project, and privately-erected signage refers to any sign put up by a non-government entity or individual (e.g. yard signs). The study area was initially a 50-mile radius outside of Eau Claire using the five most major highways coming through the city: Interstate 94 (North and South), US

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<sup>ix</sup> Ron Scollon and Suzie Wong Scollon, *Discourses in Place: Language in the Material World*. London: Routledge, 2003. Accessed April 6, 2019. ProQuest Ebook Central.

<sup>x</sup> Jaworski and Thurlow, *Semiotic Landscapes: Language, Image, Space*.

<sup>xi</sup> Jaworski and Thurlow, *Semiotic Landscapes: Language, Image, Space*, 14.

<sup>xii</sup> Monica Barni and Carla Bagna, “A mapping technique and the linguistic landscape.” In *Linguistic landscape: expanding the scenery* edited by Elana Goldberg Shohamy and Durk Gorter, 126–154. New York: Routledge, 2009.

<sup>xiii</sup> Victoria J. Kerry, “The construction of hegemonic masculinity in the Semiotic Landscape of a CrossFit ‘Cave,’” *Visual Communication* 16, no. 2 (May 2017): 209–37. doi:10.1177/1470357216684081.

<sup>xiv</sup> Scollon and Scollon, *Discourses in Place: Language in the Material World*, 25.

<sup>xv</sup> Scollon and Scollon, *Discourses in Place: Language in the Material World*, 47.

<sup>xvi</sup> Scollon and Scollon, *Discourses in Place: Language in the Material World*, 84.

<sup>xvii</sup> Jo Anna Bashforth, “Connotation and Denotation,” *California State University-Northridge*, September 6, 2015. Accessed April 4, 2019. [https://www.csun.edu/~bashforth/098\\_PDF/06Sep15Connotation\\_Denotation.pdf](https://www.csun.edu/~bashforth/098_PDF/06Sep15Connotation_Denotation.pdf).

Highway 53 North, Wisconsin Highway 93 South, and State Trunk Highway 29. A rendering of the original route by GoogleMyMaps is seen in Figure 1.

Following the steps laid out by Barni and Barna, photos of signage were taken from an automobile driver's perspective on Interstate 94, US Highway 53, and Wisconsin Highways 93 and 29. Using Google Maps, the center of Eau Claire and the end route point for all 5 study areas was determined to be at the intersection of E Grand Avenue and Farwell Street, and is the end point for all driven routes for this project. Google Maps was used to determine our routes because, arguably, it is one of the most highly used navigational tools in the United States. Visitors to the area have a large chance of using it to find their way to our community, especially when it's integrated into their cellular devices.

After taking 250 miles worth of pictures, initial categorization began. Images were categorized into four basic topics: commercial group message, ideological group/non-retail messages, individually/personally erected messages, and signs that specifically "welcome" in its message (e.g. "Welcome to Eau Claire"). Arguably, most of the signs on a driven landscape are going to be commercial in nature, that is, some retail entity seeks to invite a new customer into their community for an economic opportunity. This is seen on the highway landscape with the prolific signs advertising Culver's and McDonald's before each exit. Next, after categorization, the denotation and connotation of the messages were evaluated, and connotation was specifically analyzed for subjectively negative messages concerning a person or group. Messages of with language intended to welcome individuals to a business, institution, or place were also singled out (e.g. "Visit Menominee"). These findings were organized in a stacked bar graph to compare the landscapes, the types of signs utilized on the landscape, as well as the total amount of signs on the landscape with welcoming language as a whole.



## Results

**Signs with welcoming language within a 50 mile radius going towards Eau Claire**

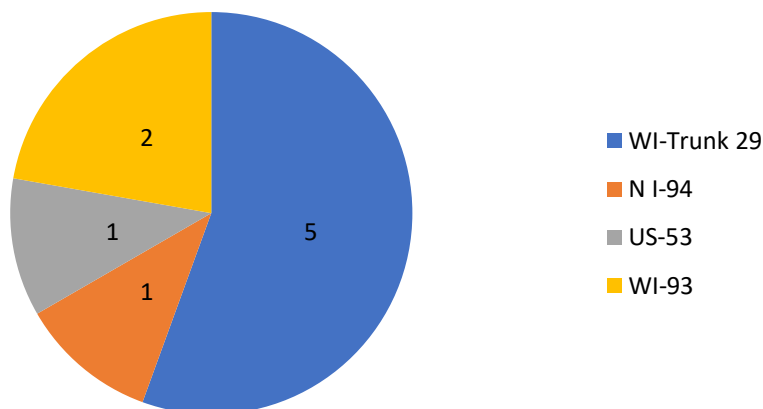


Figure 2: Stacked bar graph showing the types of signs observed within the study area and comparing overall geographic totals.

## Types of Signs observed within a 50-mile radius traveling towards Eau Claire

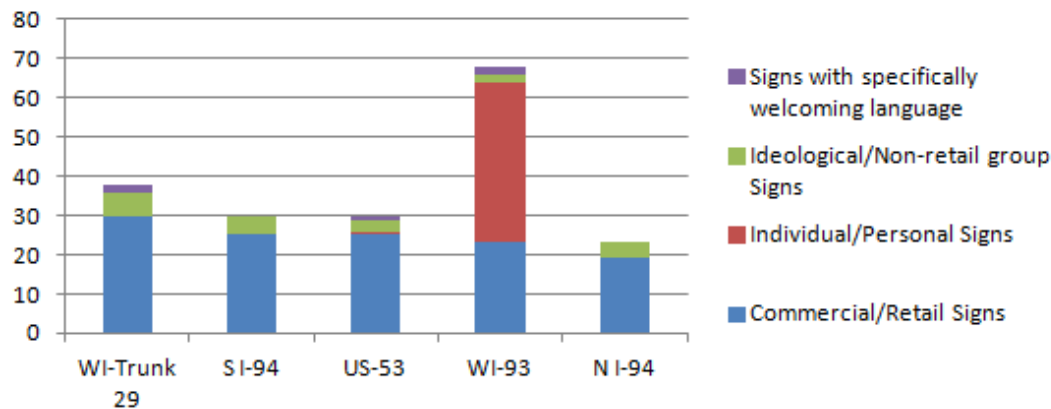


Figure 3: Pie chart showing the total amount of signs with language intended to welcome individuals to a business, a place, etc. within the study area.

During the months of July and August 2018, within a 50-mile radius traveling towards Eau Claire on the five most major highways, there were a total of 189 signs on the landscape. On WI-Trunk Highway 29, there were a total of 38 signs observed from Withee-Owen traveling west to Eau Claire, of which 30 were classified as commercial or retail signs, 6 as ideological or non-retail signs, and 2 as specifically welcoming with the selected language. On I-94, there were a total of 30 signs observed from Black River Falls going north to Eau Claire, of which 25 were classified as commercial signs, and 5 as ideological signs. On the same highway, there were a total of 23 signs observed from Baldwin going south to Eau Claire, of which 19 were classified as commercial, and 4 as ideological. On US-53, there were a total of 30 signs observed from Stanley going south to Eau Claire, of which 25 were commercial, 1 was a personal sign, 3 were ideological, and 1 as specifically welcoming. Lastly, on WI-93, there were a total of 68 signs observed from Arcadia going north to Eau Claire, of which 23 were commercial, 41 were personally erected signs, 2 were ideological, and 2 were specifically welcoming. As seen on Figure 2, WI-93's route observation amount was more than twice the size of the other route observation amounts. The calculated routes for WI-Trunk Highway 29 and WI-93 had the highest number of signs with specifically welcoming language at 2 each, found in the town welcoming signs of Thorp, Stanley, and Eau Claire, as well as a personally mounted sign in the door of Just Local Food Co-op claiming "Everyone Welcome," as seen in Figure 4.

Figure 4: Image of "Everyone Welcome" door sign from Just Local Food Co-op; Taken on WI-93 route.



Figure 5: Image of Elewa's town welcoming sign, with the text "The Crossroads of Friendship."

As seen on Figure 3, there were a total of 9 signs observed within the study area with some sort of welcoming language featured. Signs that particularly called for people to visit or called for comradery were included (in addition to the previously identified welcoming signs), and signs with only commanding language or simple information were excluded (e.g. Visit Menominee vs. McDonalds Exit 79). An example of one of these welcoming signs can be seen in Figure 5. WI-Trunk Highway 29 had the highest amount of welcoming language on the landscape, particularly in the use of the Menominee tourism advertisements.

## **Discussion**

Generally, all five study areas had similar sign categorization makeups: a large majority of advertising dedicated to commercial and retail opportunity in the area, and a very small minority as non-retail or ideologically driven signage. An even smaller minority of signage was specifically welcoming or had some sort of welcoming language utilized. While one may ask, “why isn’t there more specifically welcoming signage on the landscape?” the answer is purely economical: someone must pay for large billboard signage that can withstand the elements, and welcoming organizations most likely do not have the funds to support such messages on the landscape. Furthermore, as most signage is commercial in nature, most signs advertising retail opportunities in an area were related to some sort of chain business, such as Culver’s or McDonald’s. Therefore, to answer the main research question of this study, signs theoretically relate back to the values of an adjacent community or neighborhood, especially in landscapes like I-93 south of Eau Claire, but this idealistic view of human environments exclude a narrative of capitalism on the driven landscape. However, that is not to say that most driven landscapes with advertisements are unwelcoming; put simply, it’s bad business to alienate potential customers, which is why every exit in rural America advertises a McDonald’s or Arby’s as the next right.

The landscape between Arcadia and Eau Claire was dominated by individual/personally erected signs during the study period and had a distinct lack of traditional highway advertising billboards during rural stretches of the route. Many yards and stretches of highway resembled the photo in Figure 6 and featured many political yard signs or advertisements for local construction services.

There are many ways that the signs on the landscape within a 50-mile radius of Eau Claire could be interpreted. The experiences and background of this study’s author were controlled through primarily objective categorization process and denotation-connotation analysis structure, though bias can leak through in terms of what can be strictly classified as “welcoming” or just vaguely so. Therefore, this research, like human geographical study, is not perfect, and is continually changing just as easily as putting a new Leah Vukmir sign in the sod.



Figure 6: Photo of a yard just outside of Elk Creek with many yard signs.



## Analysis of Student of Color Experiences in the Public Education System through a Critical Race Theory Lens

By:

**Dua Ci Khang**

Mentor: Dr. Eric Torres

### **Abstract**

The use of a Critical Race Theory (CRT) lens can help shape a pedagogy that is culturally relevant for Students of Color, as well as, affirm healthier racial/ethnic identities in the classroom. CRT creates pedagogical spaces to discuss the ways in which systemic racism affects individuals and reproduces itself. Our research goal is to explain how Students of Color's racial/ethnic identities are shaped in a predominately White, K-12 public education system. The research will inquire the ways in which a multicultural pedagogy that speaks about systemic racism in the United States of America may positively impact intellectual growth and academic achievement of Students of Color.

### **The Problem**

There are less narrative spaces for Students of Color in predominately White institutions, which makes it difficult to affirm healthy racial and ethnic identities. The K-12 public education system encompasses the growth and discovery of various social identities. Therefore, it is important to create narrative spaces in the public K-12 education system for Students of Color to express and discover themselves. An important identity that can impact Students of Color, is their racial/ethnic identity. Through CRT lens, teachers can create spaces in their pedagogy and curriculum to validate the experiences of Students of Color. Through validation, Students of Color can take ownership of their racial/ethnic identity and perceive themselves as People of Color who are intellectually and academically successful.

By public policy, every student is entitled to an equitable educational opportunity. According to the Census Bureau, Children of Color have represented the majority of the children in the public education system since 2018 (Annie E. Casey Foundation, 2017). Throughout time, the demographics of students in the education system has changed and will continue to change as the number of Students of Color increases. The public education system, though, continues to function in segregated ways, sufficiently serving White, middle class families in comparison to families of color. Hence, it is important to understand how pedagogy and curricular change through the CRT lens can help strengthen the racial/ethnic identities of students of color. CRT is a theory that creates narrative spaces in the system for more authentic representation of People of Color.

CRT lens will be used to implement the preferred changes for Students of Color in the education system, such as integrating a multicultural curriculum and pedagogy and teaching about the system of racism in the United States. A component of racial/ethnic identity is awareness of racism (Altschul, Oyserman, Bybee 2007). Incorporating the awareness of racism in the curriculum is crucial in strengthening racial/ethnic identities. Utilizing the CRT lens through curriculum and pedagogy would create a more equitable, effective education system for Students of Color.

Through the lens of CRT, this research project wants to explain how racial/ethnic identities of Students of Color are shaped within a predominantly White K-12 public education system. More specifically, how a curriculum and a pedagogy, which is multicultural in nature is informative of the innate history of racism in the United States. Therefore, this examination helps Students of Color affirm a racial/ethnic identity that includes a perception of the self as intellectually and academically successful.

### **Frameworks**

#### **Critical Race Theory (CRT)**

##### *Basic Tenets*

CRT was a reaction to the decline of civil rights advancements in the 1970s. It is a movement that aims to transform relationship among race, racism, and power. Although CRT was founded in legal studies, it has become an umbrella term which now includes, "a well-developed Asian American jurisprudence, a forceful Latino-critical (LatCrit) contingent, a feisty LGBT interest group, and now a Muslim and Arab caucus" (Delgado & Stefanić, 2017, p. 3). CRT has been adopted by many marginalized groups



of people because it offers a concrete critique of the systemic oppression that exists in society. Not only does CRT offer a concrete critique, it also offers solutions to systemic oppression. There are basic tenets that most, not all, CRT theorists believe.

#### *Ordinariness of Racism*

The first tenet is the ordinariness of racism, the idea that racism is so normalized in society that it becomes difficult to address in conversations pertaining to the liberation of People of Color. Even though racism exists in the every aspects of People of Color's lives, only the most apparent acts of racism are addressed. This point is also emphasized in the book, *Critical Race Theory*, "Only the most blatant forms of discrimination such as mortgage redlining or an immigrant dragnet in a food-processing plant that targets Latino workers or the refusal to hire a Black Ph.D rather than a White college dropout" (Delgado & Stefancic, 2017, p. 9). Therefore, the everyday racism that People of Color experience are dismissed or invalidated. It is important to note that racism does not exist without the daily microaggressions that People of Color face daily.

#### *Interest Convergence/Material Determinism*

Interest convergence, the second tenet, addresses the problem of White people being the primary beneficiaries of civil rights legislation. (Hirald, 2010, p. 56). A prime example of this would be *Brown v Board of Education* which was the decision to desegregate and integrate the public schools. Many people saw the case as something that only benefitted Black people, but Derrick Bell argued that the Supreme Court made the decision to desegregate the public schools because the interest of White people converged with the interest of Black people. During *Brown v Board of Education*, the United States was entangled in the Cold War. The United States was pressing democratic imperialism onto many Black, Brown, and Yellow countries. As noted in the book, *Critical Race Theory*, Delgado and Stefancic quoted Bell's critique that the ill treatment of People of Color in the United States was not helping the country's cause in the Cold War, "It would ill serve the U.S. interest if the world press continued to carry stories of lynchings, Klan violence, and racist sheriffs" (Delgado & Stefancic, 2017, p. 23). Therefore, the sudden decision to desegregate the schools was a result of the converging interest of White and Black people. The decision had political intentions that painted a positive picture of the United States, despite the ways it continued to exerted democratic imperialism onto Black, Brown, and Yellow countries.

#### *Social Construction Thesis*

This is the notion that race and races are a social construction created by a process of social thoughts. How racial groups are perceived in the United States continuously changes because race is socially constructed. Race is not based on anything permanent, therefore, when dominant society needs to make a certain group of color terrorists, they are able to do so. As Delgado and Stefancic highlight in *Critical Race Theory*, "In one era Muslims are somewhat exotic neighbors who go to mosques to pray several times a day – harmless but odd. A few years later, they emerge as security threats" (2017, p. 10). Images and stereotypes of a Group of Color shift over time according to what dominant society needs. The social construction of race is detrimental to the social identity development of People of Color because their identities are subjected to a group identity. Some examples of stereotypes are that all Asian people are smart, all Muslim people are terrorist(s), all Black people are criminals, and the list goes on. It is important to acknowledge the ethnic diversity within racial groups because of how race is socially constructed. Often times, some People of Color have no connection to their racial identity except for the oppression they experience because of it. Other times, the racial identity is the only connection some People of Color have because of the ways their ethnic identities have been suppressed. This makes it extremely difficult for People of Color to develop a healthy social identity that is proud and resilient of their own racial or ethnic identity.

#### *Unique Voice of Color*

The fourth tenet, Unique Voice of Color, acknowledges the power People of Color have in reclaiming and retelling their experiences. People of Color's experiences with racism is an important component in the process of creating a racially equitable society. Unique Voice of Color acknowledges the diverse experiences of People of Color, in regards to racial/ethnic identity. There is an emphasis that different racial groups experience racism differently. Within those racial groups, the ethnic groups also experience racism differently. Therefore, Unique Voice of Color encourages People of Color to share their unique narratives when they feel it is safe. This amplifies the voices of people who are oppressed, as well as gives them ownership of the telling of their own experiences.

## Critical Pedagogy

Critical Pedagogy is the emancipation of oppression through critical consciousness. Critical consciousness is the ability to intervene in reality in order to change it. In critical pedagogy, it is emphasized that teaching is a political act, there is no neutrality of knowledge, and that teachers should give students tools to see themselves as individuals in charge of their own production of knowledge. Peter McLaren is a critical pedagogy scholar that emphasizes the profound importance of critical pedagogy in society.

“Critical pedagogy is way of thinking about, negotiating, and transforming the relationship among classroom teaching, the production of knowledge, the institutional structures of the school, and the material relationships of the wider community, society, and nation state.” (McLaren, 1999 p. 445)

As McLaren highlighted, the ability of being critically conscious should transgress beyond the classroom and impact the community in which the students exist in. Critical pedagogy can have life changing impacts on how individuals view themselves and those who practice it must continuously challenge themselves. It is noted that those who practice critical pedagogy in life are always unlearning, relearning, reflecting, and evaluating. Liberating youth to understand that they are in control of their own knowledge and encouraging individuals to equip themselves with the tools to challenge the system that oppresses them are two ideas that critical pedagogy supports. Not only does critical pedagogy demand spaces for equitable representation but demands spaces where marginalized individuals are in control of producing their own narratives.

## Culturally Relevant Pedagogy

Culturally relevant pedagogy is a pedagogy that incorporates the lived experiences of the students' lives in a collective manner. The three criteria to culturally relevant pedagogy are: students must experience academic success, students must develop and/or maintain cultural competence, and students must develop a critical consciousness through which they challenge the status quo of the current social order.

### *Students Must Experience Academic Success*

No matter the social situation, students must be encouraged to choose academic success in the classroom. Educators in the classroom must continuously encourage the students in the classroom to see themselves as academically inclined and to aid in their growth towards becoming more academically successful. The role of the educator is not to make students feel good about themselves but rather encourage students to reach the academic expectations that were expected of them. Students must also feel as if their knowledge of the world is important in the classroom, thus educators must know how to incorporate that into their classrooms so that students feel validated and motivated.

### *Students Must Develop and/or Maintain Cultural Competence*

Another important component of culturally relevant pedagogy is that students must develop or maintain cultural competence. This is often done through incorporating students' cultures into the classroom and utilizing the cultures to direct the classroom. In Gloria Ladson-Billing's article, "But That's Just Good Teaching", she highlighted how an educator used rap, which was culturally relevant to many of the students in the classroom, to direct her classroom, "Thus, while the students were comfortable using music, the teacher used it as a bridge to school learning" (1995 p. 161). Often times, experiences of Students of Color are condemned in the classroom but when educators utilize the experiences in the classroom there is a stronger connection built between the classroom and the student.

### *Students Must Develop a Critical Consciousness*

Students are challenged to apply both academic excellence and cultural competence to a lens broader than the individual. They are encouraged to develop a sociopolitical understanding of society, through which they challenge the status quo of the current social order. To develop a critical consciousness, the individual must "engage the world and others critically" (Ladson-Billing, 1995 p. 162). Students must see themselves as individuals who can engage society in conscious conversations that challenge oppressive systems that exist in society. When students are able to critically challenge the world and others they become better citizens that are always striving for an equitable society.

## **Methodology**

### **Narrative Inquiry**

The methodology used for the analysis of the written narratives and oral interviews were Narrative Inquiry methodology. Narrative Inquiry focuses on individual narratives and a four step analysis of those narratives. Through Narrative Inquiry, the voices of the individuals are amplified and their experiences are presented in a multi-dimensional way. This allows for the interviewee and interviewer to develop a connection in which lived realities can be shared. In the book, *Narrative Inquiry Methodology*, Daiute expressed the ways Narrative Inquiry connects people and experiences.

“Dynamic narrative inquiry builds on a notion of interaction extending the field in a different way – a way that connects researcher and subject, particular and broader stories, solidarity and conflict in terms of language and activity as intelligent tools for relationship and diversity for the collective development of humanity.” (2014, p. 253)

Through Narrative Inquiry, not only are narratives shared through interviewee and interviewer but a larger picture of the experiences that the interviewee and interviewer share are painted. Through Narrative Inquiry, people can better understand the social implications of racism and self-perception, pertaining to racial/ethnic identity because the qualitative narratives humanize the experiences of individuals. Narrative Inquiry requires a four step analysis which were utilized throughout this research to analyze the written narratives and oral interviews of Students of Color.

### *Value Analysis*

Value analysis is a way to identify narrative meaning in terms of values expressed from the individual's narratives. Values are often times illustrated rather than announced, meaning that values are not always explicitly spoken. They are extremely important because they showcase what is valued in that person's relationships, culture, religion, and overall beliefs. Within value analysis there are major values and minor values. Major values are continuously expressed throughout the narrative and often organize an entire narrative. Whereas minor values are mentioned throughout the narrative but not as extensively as major values. Both are very important and help analyze what is explicitly spoken to better understand the narratives and experiences of individuals.

### *Significance Analysis*

Significance analysis focuses on the seemingly meaningless expressions that help create a larger picture of the social and environmental situations of individuals. Significance analysis takes a closer look at how individuals evaluate the situations in which they experience. Evaluative devices are utilized in the significance analysis process to determine evaluative patterns that showcase how individuals want to perceive themselves in a conversation, focus group, interview, and other environments. The evaluative devices include psychological state expressions, intensifiers, qualifiers, casual connectors, negative/hedges, and valence (positive or negative).

### *Plot Analysis*

Plot analysis looks at the structures of narratives and considers how narrators are used during the plots. Within the context of plot analysis there are characters, initiating action, complicating actions, high point, resolution strategies coda, and narrator stance. Through plot analysis the frames utilized by research participants can be further recognized and analyzed. The inclusivity of storytelling in a research setting is viewed as reliable through the ways narrators utilize storytelling. Therefore, plot analysis is important because it is the structural aspect of an individual's narrative.

### *Character Mapping and Time Analysis*

Character mapping and time analysis is the examination of meanings across different narrative perspectives and experiences. Character mapping specifically looks at the character analysis across narratives through identifying the frequency of character mentions and looking at the character's specific roles. Time analysis utilizes time markings to differentiate between past, present, and imagined phrases in the narratives. Time marking is used in everyday lives therefore, it becomes helpful in understanding individual's views or experiences in terms of whether they talk about it in past, present, or imagined time.



### **Qualitative and Quantitative Aspects**

Both qualitative and quantitative research methods were practiced throughout the research. The data for this research project was collected through surveys to all high school students in the school district. The surveys provided information about the universe of students in a Midwest school district. The surveys were the quantitative aspect of the research and were measured on the likert scale (1-4 from Strong Agree to Strongly Disagree). There was one write in question asked and eight likert scale questions asked.

The short narratives and oral interviews provided nuanced information about lived experiences from selected Students of Color within the same district. The oral interviews and prompted short narratives were collected from selected Students of Color in the school district. The written narrative prompt included five questions and the oral interviews included ten questions. Both surveys and interviews include questions about students' experiences and ability to voice and express racial/ethnic identities in the classroom, culturally relevant content developed in the classroom, perceived cultural competence of teachers, and perceived signs of racism.

### **Findings from Data**

The findings from the prompted written narratives, oral interviews, and surveys painted a better understanding of Student of Color experiences in Midwest schools, as well as, the overall racial climate in the schools. There was a total of four one on one interviews and written narratives and eleven surveys. All participants were enrolled in a public high school, nine through twelfth grade, from a Midwest school. All those who participated in one on one interviews and written narratives were self-identified Students of Color.

#### ***Written Narratives and Oral Interview Findings***

A few of the guiding questions or prompts from the written narratives and oral interviews were:

1. Please explain how faculty and/or students affected your safety, acceptance, validation, and/or comfortability in the classroom, did you feel that you had a safe space to go in the school to talk about your experiences.
2. Does your school offer you separate classes that teach about your racial/ethnic identity?
3. Could you describe to me what racism would look like to you, and have you experienced racism in your school before?

Narrative Inquiry methodology was utilized in the analysis hence, major/minor values analysis, significance analysis, character mapping and time analysis, plot analysis, and time analysis were utilized. The common themes that came up were Americanized, Lack of Representation of Racial/Ethnic Identity in the Classroom, and Racism.

#### ***Americanized***

Through analysis, the common theme of Americanized showed up throughout the participant's narratives. Americanized is often a term used to identify a Person of Color who exhibits White cultural characteristics. Participants often talked about how they felt as if they were too Americanized to be considered Hmong because of the ways they were raised at home. Participant Y stated, "When we do have the dress up days but I don't even have Hmong clothes that's how Americanized I am. If I could speak my native language I would but both of my parents are both Americanized." Participant Y did acknowledge that they do not have Hmong clothes and lack the Hmong language fluency but connects that to the ways they have been raised by their parents. This showcases the difficult position of a student who self-identifies as Hmong but does not have the traditional qualities of a Hmong person because they were not taught that as they grew up.

Participant Y also highlights how other Asian individuals reacted to them being Americanized, "My mom wanted me to go out there because I don't have Asian friends. I've had other Asian kids tell me that I'm too whitewashed to be friends with them." This brings into the picture how the greater Hmong society reacted to Participant Y, who did not encompass the traditional qualities of being Hmong. This puts Participant Y in a difficult situation where physically they are a Hmong person but in the context of language and culture they are not. This can encourage an identity crisis where one is not Hmong enough or White enough, making it difficult to affirm healthy racial/ethnic identities.

Participant X expressed similar experiences with being Americanized when they self-identify as Hmong. They expressed similar experiences as Participant Y, in that they cannot speak the language and do not practice Hmong traditions at home. "There isn't a difference (cultural difference between home and school) because my parents they raised us to be very American like. We don't really talk Hmong or have our own traditions at home" Although Participant X did note that their home experience is Americanized and not very Hmong, they still mentioned self-identity struggles in relation to racial/ethnic identity.

Their home experience was Americanized in their eyes but yet they faced difficulties being accepted into the dominant

American culture, which is White. This struggle of feeling as if their life experience is Americanized but being treated as if they are different was showcased in the narrative as Participant X discussed their struggles with self-identity,

“Because I feel like my teachers don’t really understand the concept of us (People of Color) having problems with ourselves. So my Hmong or Asian friends they help me with accepting the racial differences. And they help me with coming to terms with my racial awareness or something”

Participant X still mentioned their difficulty with racial awareness despite the Americanized life they grew up in. This puts Participant X in a difficult spot, similar to Participant Y, where they are not Hmong enough or White enough. Students of Color experience problems that can be and are often different from White students, such as Participant X and Y have expressed. As Participant X noted, their teachers did not understand that Students of Color had problems with themselves. As Gloria Ladson-Billings wrote in their article, “But That’s Just good Teaching! The Case for Culturally Relevant Pedagogy”, culturally relevant pedagogy requires that students must develop and/or maintain cultural competence. (1995 p. 160). For these students, it is important to include their culture in the classroom so they have space to deconstruct the complex identities of the Hmong diaspora. To have a place to discuss how the Hmong identity is always changing according to the geographic and cultural locations of where Hmong people settle. The two Americanized Hmong youth were having racial/ethnic identity struggles that were going unnoticed in the classrooms.

#### *Lack of Representation of Racial/Ethnic Identity in the Classroom*

Throughout all four of the narratives, this notion that there was a lack of representation of their racial/ethnic in the classroom was prevalent. Specifically, participants mentioned how there was lack of representation of their racial/ethnic language, cultures, and history in the classroom. Participant A mentioned the difference of Spaniard Spanish and the Mexican Spanish they spoke in their home,

“You can still see the difference because I am Mexican American. In schools they teach Spanish from Spain, which is completely different than Mexican Spanish. At times I have spoken about it to teachers, asking why do we only talk about Spaniard Spanish? Why don’t we talk about my culture?”

Participant A recognized the difference in the types of representation that were being showcased in the classroom. Spanish was being taught through a White context, only recognizing the Spanish spoken in Spain. Despite the misconception that this is representation of all Spanish speakers, individuals from Black and Brown countries that speak Spanish notice the lack of representation and inclusivity. Participant A, who is from a Black and Brown country that speaks Spanish was very resistant that only Spaniard Spanish was taught. To Participant A, language was connected to their culture. As the Spanish they spoke at home was being excluded in the classroom, so was all the culture and history that was infused into with the Spanish language.

Building on this notion of excluding language, culture, and history, Participant Z talked specifically about the lack of Hmong culture and history in their high school. Along with culture and history, Participant Z highlighted the complex identities of how Hmong people are refugees in the United States and the lack of space to discuss their experiences in the education system. Participant Z stated this in regards to having a Hmong Culture and History class,

“It is important to understand the Hmong culture to make education culturally relevant. The times I’ve spent at school, I find the interaction of culture and immigrant education is a complex one. An immigrant must have cultural negotiations with family from different generations as well as their teachers. We all know the importance of students seeing adults that look and talk and speak like them. That’s why I think it’s important to have a Hmong class for students”

Participant Z looked at the complex identity issues that Hmong people face and how that was not being translated over into the educational realm. Specifically, the notions of culture, history, inclusivity, and representation were not being reflected in the classroom. Therefore, Participant Z had this deep desire for a class that incorporated Hmong history and culture to be developed so that younger Hmong students could have a space to feel validation for their own experiences in the schools.

Participant X also indicated how a history class taught from the Hmong perspective and maybe even by a Hmong person would be more beneficial in incorporating different perspectives. In regards to Hmong history being taught in the classrooms, “They didn’t really go into depth about it, they just briefed over it with the American winning side I guess.” Very similarly, Participant Y also mentioned the dominant perspectives being taught about Hmong history in the classroom as they noted, “And for history we have class but when he’s teaching it he’s only teaching the American side and he is not really teaching it from other sides.”

Now, when asked if they would like a Hmong history and Cistory class taught Participant X said, “Hopefully it’s more on the perspectives of our own people rather than from somebody else’s perspective. Maybe taught by a Hmong person too.” Participant Y

answered similarly, "I wish we did have a Hmong class we could take." Aspects of dominant perspectives being taught in the classes, as well as, lack of representation of Hmong perspectives and Hmong teachers were noted by Participant X and Y in their narratives.

In culturally relevant pedagogy, one of the main criteria is that students must develop and/or maintain cultural competence and that can be done through incorporating students' racial/ethnic culture into the classroom. The findings that all four Students of Color indicated the lack of racial/ethnic representation in the classroom is concerning. This does indicate that the aspect of culturally relevant pedagogy that highlights cultural competency is not being incorporated into the classrooms.

### *Racism*

Often times, the participants mention racist incidents that happened to them. This theme of racism was prevalent and discussed within most of the narratives. It is important to note that some of the racist experiences of the participants happened off of school grounds but that the participants did try to seek support from staff or faculty in the schools. Also, racist incidents are extremely traumatic and I would like to express immense gratitude for the participants that allowed themselves to be vulnerable with me through sharing their experiences.

Racism often occurs at all stages in life for People of Color, even at young ages such as elementary school. Participant X spoke on their experiences as a young Person of Color who was treated differently, "I was bullied when I was very little. I just had a different facial structure and they just didn't like that." The traumatic experiences do start at young ages and that is important to note when working on building healthy racial/ethnic identities for People of Color.

In the higher grade levels, racism still occurs in the schools as Participant Z explained their racist experience in the cafeteria, "When we sat with them (White students) they were giggling and stuff and speaking in another language and mocking us and everything because we were talking Hmong." Participant Z and their friends did report the incident but when asked what was the result Participant Z said, "Then we had to write a letter to report it to the principal but it seemed like they didn't really care about it." On a similar note, Participant Y also noted their experience when they told someone from higher administration about the racist incident they experienced off school grounds, the response they got was as Participant Y said "he looked at me and told me there is nothing he can do and he smiled and then I went home".

In all aspects of People of Color's lives, racism is prevalent and occurs in and out of the schools. As CRT notes, racism is ordinary in society. (Delgado & Stefancic, 2017, p. 9) What is problematic in what the Participants Z and Y noted is that they both did not receive the help and support from higher administration. Although Participant Z did note that there was one faculty member that helped them write the letter to the principal, "Ms. X actually helped me though the whole thing." This faculty member was not a part of higher administration. On the same lines, despite the fact that Participant Y's racist incident happened off school grounds, they sought help from the support systems in the schools. What Participant Z and Y experienced with higher administration reflects CRT's notion of interest convergence. Because the interests of the higher administration, who were White, did not converge with the interests of the Students of Color, the student's struggles were pushed aside. This can cause disconnect between a Student a Color and the school as Participant Y mentioned that after the response from the higher administration, they lost trust in the school.

### *Survey Findings*

Any student regardless of race and/or ethnic background, who was willing to participate in completing the survey, was asked to self-identify their racial or ethnic background. There were two questions/statements from the survey that gave the most prominent evidence in understanding the universe (or school environment), of the schools that participated in the research. It is noted that the answers (1-4 from Strong Agree to Strongly Disagree) from these two questions were also the ones that had the most contrast between Students of Color and White students. The first statement was, "Your school offer separate classes that teach about racial and ethnic identity." The second statement was, "You have experienced racism in your school before."

The first statement, your school offers separate classes that teach about your racial/ethnic identity. Such as separate language classes that teach your native language and/or separate history classes that teach about your people's history showed stark differences in the way Students of Color answered compared to White Students. For Students of Color, one Student of Color said strongly agree, five Students of Color disagree, and two strongly disagree. For White students, all three said strongly agree. It can be interpreted that Students of Color racial/ethnic identities are not being included in the classrooms and the White racial/ethnic identity is being included in the classroom.

The second statement, you have experienced racism in your school before was also answered different by Students of Color compared to White students. For Students of Color, one said strongly agree, five said agree, one disagree, and one strongly disagree. For White students, one said agree, one said disagree, and one said strongly disagree. The majority of Students of Color indicated they have experienced racism in the schools whereas the majority of White students indicated they had not experienced racism in the schools.

## **Discussion**

In this case study, I examined the experiences of Students of Color in the Public Education System in two Midwest Schools through a CRT lens. The four written narrative and interview participants created a larger understanding of how Students of Color are having difficulty affirming healthy racial/ethnic identities inside and outside the school setting, seeing the exclusion of their racial/ethnic identity in the classroom, and experiencing responses from the higher administration about the racist incidents that happened to them.

This research emphasizes CRT's tenant, Unique Voice of Color. In that the honest and powerful voices of five Students of Color are telling a narrative of their experiences as students in at predominately White schools that do not help them produce a healthy/racial identity. Their narratives tell of a system of education that does a disservice for Students of Color because it does not ensure that every student is entitled to an equitable educational opportunity. Students of Color are yearning for classrooms that are inclusive of their identities and the racist experiences that come with their identities. This leads to the question of how the education system will change to guarantee an equitable educational opportunity for all students.

## **Limitations and Future Directions**

As a young scholar who is deeply passionate in advocating for equitable education reform that is grounded in CRT, Critical Pedagogy, and Culturally Relevant Pedagogy, I intend to conduct this research on a larger scale so that more voices of students, particularly Students of Color can be amplified. The limited number of participants in this study certainly prevents broad generalization of the results. Given its nature as a pilot study, the data presented provides a path for future studies. It would be interesting to see this study repeated with a larger number of participants to see if the patterns yield the same or similar results.

I am extremely grateful for the young participants that spoke truth to their experiences in this research and I think it would be interesting to connect with them again in a few years to see how they are doing. Especially in regards to the development of their racial/ethnic identity and if they attended higher education, if their experiences were different or similar to high school. This could create a larger understanding on how racial/development at an early age can possibly transgress throughout an individual's whole life.

What is also important in the future of this research is the work to disaggregate the data in terms of ethnic identity, gender, sexuality, class, and disability to ensure that the intersectional needs of individuals are being heard by a larger audience. Specifically, a larger audience that has the ability and power to make changes in the schools. It is important to note that students who are oppressed by systems of oppression cannot be left behind in the push for equitable and critical educational reform in the United States. Therefore for my future research, I would like to include a multitude of lens that can further challenge the education system to be more equitable.

## **Acknowledgements**

As a Student of Color who went through the public K-12 education system without ever being asked how I am doing, I thank you all for reading this far as these Students of Color's experiences reflect much of the struggles that I have gone through. We asked them how they are doing and they spoke truth.

With all of me, I would like to thank my parents, Num Kaws Khaab and Yiv Vaaj Khaab, for always advocating and supporting my education even at the expense of their own wants and needs. They are the first ones who taught me to be proud of my Hmong identity and I always appreciate the way they believe in everything I do. They are my first teachers in life. Along with that, I would like to thank my family that pushes me to be the best I can be every day.

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*Thank you to all the social justice fighters out there fighting for equitable and just change in all parts of the system. Know you are not alone and that the good fight will be worth it.*

*Thank you for reading this and please remember the good fight is never the easy fight.*

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## **Modeling the Influence of Land Use/Land Cover Change on Surface Water Quality in the Lower Mekong River Watershed, Cambodia**

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### Abstract

Water is pivotal to the existence of humans, organisms, and other elements of the ecosystem and as such, its quality should be at the highest level. Human activities are increasingly resulting in modifications to the landscape with serious implications for surface water quality. As a result of the intricate and interwoven relationship between land use/land cover (LULC) and surface water quality, it becomes important to investigate this phenomenon especially in a vulnerable area within the developing world such as the Lower Mekong River watershed in Cambodia. The main goal of this research is to investigate the relationship between LULC change and surface water quality in the Lower Mekong River watershed, Cambodia. Landsat satellite data provided LULC information for the following years – 1988, 2004, and 2018. LULC information was generated by implementing object-based image analysis followed by expert system. Image classification accuracy ranged between 82% and 87%. The Soil and Water Assessment Tool (SWAT) was constructed and used to model the concentration of total suspended sediments (TSS) and nitrogen levels at the sub-basin level. Results of this study shows that agricultural land increased over 218.8% between 1988 and 2018 while forest decreased 62.9% over the same period. TSS concentrations and total nitrogen load significantly increased over the past 30 years, especially in areas where forested land has been stripped in order to be used for agriculture or urbanization.

### Introduction

Previous studies have examined the influence of LULC change on the quality of water in various watersheds at multiple spatiotemporal scales (Ren et al., 2003; Li et al., 2008; Shrestha et al., 2008; Ribolzi et al., 2010). Urban LULC account for some of the greatest water pollution problems due to expanding population and its associated infrastructure needs (Tong et al., 2002; Ren et al., 2003; Li et al., 2008; Wilson, 2015). Farmlands and animal feedlots outside urban areas have also been identified as major sources of water pollution of which nitrogen, phosphorus, suspended sediment, and fecal coliform are amongst the most widely reported (Tong et al., 2002; Li et al., 2008; Wilson, 2015).

Across multiple studies, a consistent pattern observed outside major urban areas is the influence of heavy rainfall on increasing the amounts of suspended sediment, nitrogen, and phosphorus loads (Tong et al., 2002; Li et al., 2008; Ribolzi et al., 2010; Wilson and Weng, 2011). Depending on a surface's permeability, if it is semi-impermeable or impermeable, it reduces infiltration rates which results in an increase of surface runoff and the loading of pollutants (Abbaspour et al., 2006). Developing countries with a monsoon climate and greater areas of exposed soil, such as those used for agriculture or urban development, need to be monitored carefully due to the association between LULC and surface runoff during heavy precipitation.

Changes in agricultural and urban LULC can contribute to increases in sediment and nitrogen load due to soil erosion and excess wastewater (Sim and Balamurugan, 1991; Foley et al., 2005; Valentin et al., 2008). Nitrogen-based fertilizers used for crop cultivation have contributed to higher loads of nitrogen in agricultural basins and have negatively impacted water quality while deforested lands have increased the flow rate and quantity of water (Meyer and Turner II, 1992).

Before the year 2000, Cambodia's main agricultural product was rice which was mainly concentrated in the southern part of the country near the Mekong River. During this period, croplands were mainly irrigated by rain including streams and rivers proximate to farmlands (Xiao et al., 2005). However, after the 2000's, farmers began to rapidly modify the farming culture by incorporating other crops such as maize, soybean, and mungbean (Farquharson et al., 2006), establishing irrigation farming, and the use of pesticides and synthetic fertilizers (Schreinemachers et al., 2017; Murphy, et al., 2018).

There are multiple modeling tools that have been used to predict and monitor surface water quality. The export coefficient model can be used for large scale regions to identify sources of non-point source pollution such as total nitrogen and total phosphorus (Wu et al., 2016; Hua et al., 2019). The build-up wash-off coefficient modeling method estimates pollutant build-up and transport during surface runoff (Hossain, 2010). The soil and water assessment tool is a fully distributed model which assesses how land changes over long periods of time and its impact on surface water quality and flow at daily time steps (Arnold et al., 1998). For all of

these water quality modeling tools, input LULC data is required which remote sensing technology can aid in providing (Wilson, 2015).

The purpose of this research is to analyze LULC change on surface water quality in the Lower Mekong River watershed located in Cambodia. However, previous studies (Costa-Cabral et al., 2008; Johnston & Kumm, 2011) have similarly tackled this subject but at a smaller scale. By being able to increase the scale of the study area, more specific and unique research findings may be obtained, especially in a vulnerable area like Cambodia.

This study examined three objectives: (1) to produce LULC information for the watershed between 1988 and 2018 at three timesteps, (2) construction of a hydrologic-water quality model to predict TSS and total nitrogen load, and (3) to probe into the surface water quality response to LULC changes with regards to the TSS (mg/L) and total nitrogen load (kg).

## Methods

### *Study Area*

This study is conducted in the Lower Mekong River watershed, Cambodia, Southeast Asia (figure 1). The country has an approximate population of 16 million people on 109,681 square miles of land, and 1.5 million of them live in the capital city Phnom Penh (CIA, 2018). Cambodia is a relatively young country with over 50% of the population being under 25 years old (CIA, 2018). The physiography of Cambodia consists of mountains on the Western and Eastern regions of the country and mounds in between. The Mekong River flows through the entire Cambodia in a north-south direction. The climate is tropical with a monsoon season from May to November. Agricultural and forested lands dominate the landscape (CIA, 2018). In 2017, the gross domestic product (GDP) of Cambodia was 64.21 billion dollars (CIA, 2018). The country's national income largely comes from garment export, tourism, real estate, and agriculture. Statistics show that there is a high underemployment (CIA, 2018). In 2012, about 17.7% of the population was below poverty (CIA, 2018). It is important to note that in 2015, 70% of the population did not have access to a pipe-borne water system (World Bank, 2017).

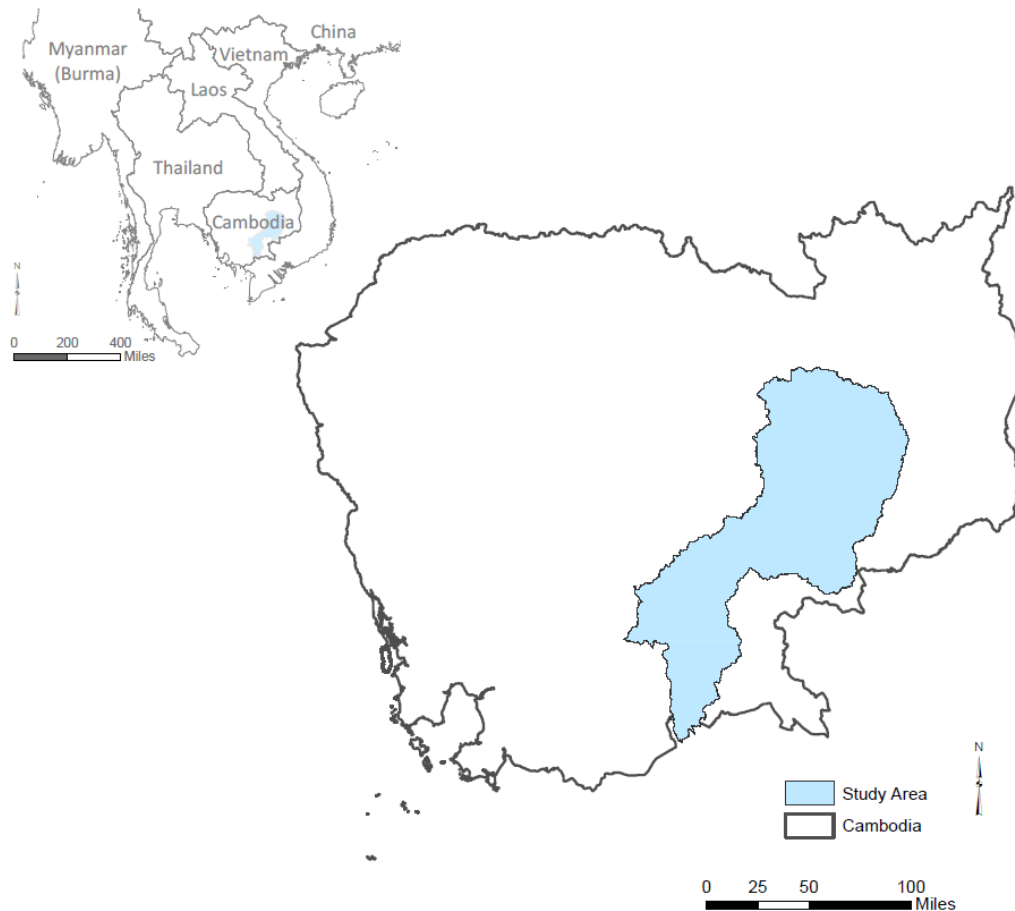


Figure 1. Lower Mekong River watershed, Cambodia.

### *Image Processing*

This study made use of Landsat-5 and Landsat-8 satellite image scenes for the time period 1988, 2004, and 2018 respectively (USGS, 2018). The image scenes were captured during the country's dry season between the months of January and March in order to obtain cloud free cover data. As a result of the relatively large areal extent of the watershed, four image scenes were required for each time step.

Image scenes were already corrected for atmospheric interference before distribution by the USGS (Schmidt et al., 2013). Mosaicking was implemented for the four image scenes of each time step and then the Mekong River watershed was extracted.

The next stage of image processing was the extraction of LULC information through classification. This study employed object-based image analysis (OBIA) followed by an expert system classifier. The object-based technique is desirable because it creates segments based on spectral and spatial characteristics of pixels and has been proved to result in more efficient and accurate output (Zhou et al., 2008; de Castro et al., 2018). Next, the objects were classified with the random forest classifier using training samples between 50 and 100 per LULC class. The LULC classes extracted include agriculture, shrub, forest, urban, and water. The classification scheme adopted a modified Anderson level 1 classes (Anderson et al., 1976). The random forest classifier is a machine learning supervised classification algorithm that constructs multiple decision trees based on training samples (Gislason et al., 2004). This study constructed 500 trees in an effort to arrive at highly accurate classified images. The expert system classifier was implemented to increase accuracy by manually correcting misclassifications using reference data from Google Earth (Google Earth, 2018). The classified images were assessed for accuracy using Google Earth as reference data for all three-time steps (Google Earth, 2018). Overall accuracy ranged between 82% and 87% accuracy. The kappa statistic ranged between 0.77 and 0.82 for the three-time steps.

### *Hydrologic-Water Quality Modeling*

The Soil and Water Assessment Tool (SWAT) was used to model hydrologic-water quality. SWAT is a fully distributed hydrologic-water quality model that evaluates land management practices on water flow and quality in river basins over long periods of time (Arnold et al., 1998). The model's input include soil, elevation, LULC, and climate. SWAT runs on a daily time-step but can be aggregated to monthly timesteps for result presentation.

The soil data was obtained from the Food and Agriculture Organization of the United Nations (FAO, 2003). The classified LULC data above provided LULC information. Elevation data was from the Shuttle Radar Topography Mission – SRTM (NASA JPL, 2013), while the climate data was from the Climate Forecast System Reanalysis – CFSR (Saha et al., 2010).

After running SWAT and obtaining a SWAT output, a hybrid model calibration for flow was done by utilizing the SWAT Calibration and Uncertainty Program (SWAT-CUP) and manual means. Manual calibration was implemented because of the very low agreement between observed flow and simulated flow. This can be attributed to the significant artificial restructuring of the Lower Mekong River network, such as dams, which resulted in exceptionally high flows in excess of what rainfall and temperature naturally generates. Validation was not conducted due to the limitation of data availability, but since calibration was completed, a final SWAT model was constructed.

A total of 137 subbasins were created (figure 2), and the total area of the watershed is 9,267.8 square miles. Eight reservoirs were manually inserted in an attempt to increase simulated flow. Three gauging stations were used for calibrating flow, these include Kratie (a), Kampong Cham (b), and Chroy Changvar (c).

### Results and Discussion

Analysis of LULC trajectory over the study period (1988-2018) reveals that forest cover (-62.9%) and shrub (-97.6%) decreased the most while agricultural land (218.8%) significantly increased (table 1). Moreover, urban land cover (160%) also significantly increased especially in the capital city Phnom Penh, which might be attributed to the estimated population growth of 1.5 million (Mom & Ongsomwang, 2016). Increase in agricultural land can be attributed to the increase in the population of residents in the watershed over the study period (estimate 60%), and the fact that most residents in the watershed practice agriculture (Murshid, 1998). The growth in agricultural land over the study period is mainly evident along the Mekong River where settlements are developed along the river course, and agricultural fields are located in proximate location to the settlements.

Forest and shrub significantly decreased throughout the 30 years which may be attributed to the conversion of land to make room for agriculture and urban activities (figure 3 and table 1). This finding is consistent with that reported by Pandey et al., (2013) and Hor et al., (2014) in Cambodia respectively. Water also decreased 6.1% between 1988 and 2004 and 9.3% between 2004 and 2018. Throughout the watershed, there were multiple ponds. From a detailed visual inspection of the LULC images, it can be concluded that some ponds were tiled to make room for the expanding rice paddy fields and other crops (Figure 3).



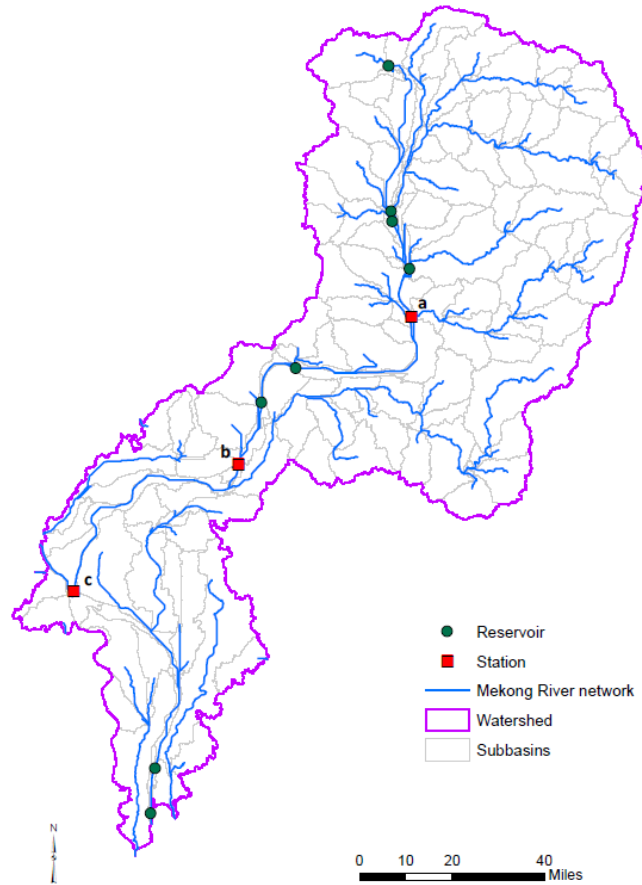


Figure 2. The Soil and Water Assessment Tool model construction.

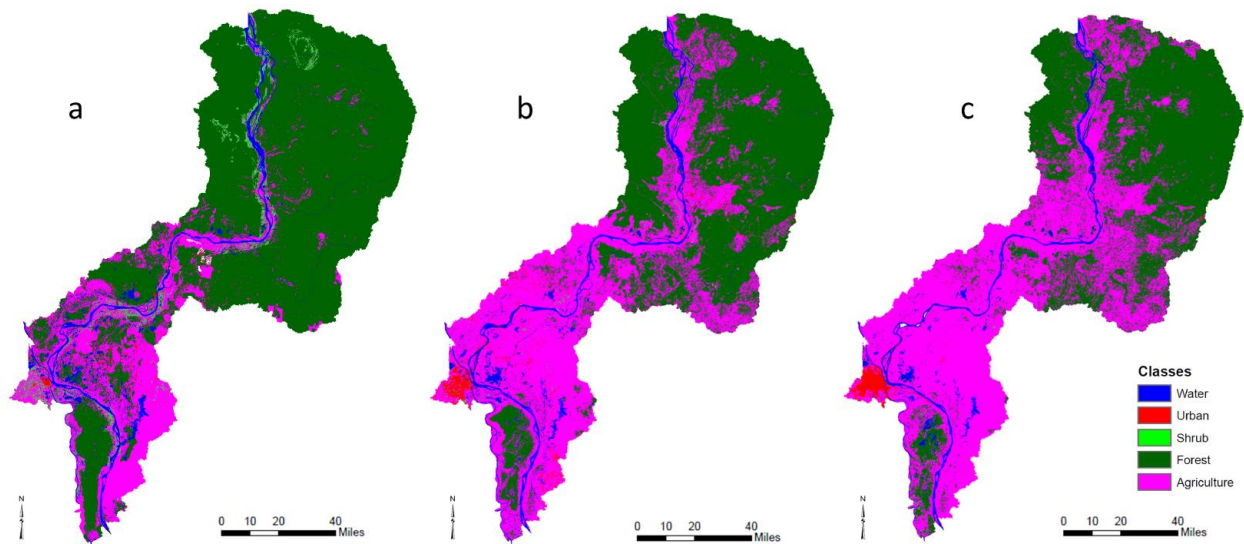


Figure 3. Land use/Land Cover classified images for 1988 (a), 2004 (b), and 2018 (c).

Table 1. Land use/land cover change (%)

Classes	1988-2004	2004-2018
Agriculture	102.8	57.2
Forest	-27.6	-48.7
Shrub	-93.7	-61.9
Urban	110.0	23.8
Water	-6.1	-9.3

Hydrologic-water quality modeling demonstrated that TSS concentration level increased gradually between 1988 to 2018 (figure 4). Specifically, between 1988 and 2004, the western and eastern portion of the watershed increased from about 90 mg/L to roughly 200 mg/L which is fairly similar to the values indicated by Li et al., (2014) in the Lower Mekong Basin. These spatial patterns align with LULC that transitioned from shrub or forest to agriculture or urban. Furthermore, between 2004 and 2018, the same areas previously mentioned that maintained agriculture LULC also illustrated high levels of suspended sediment concentrations. The spatial patterns of TSS may help indicate that lower flow is occurring in areas that are forest or shrub because of higher infiltration rates. Then, as the land becomes bare or transition to crops, infiltration reduces which increases flow thereby results in a buildup of sediments in the water (Wilson et al., 2018). If there is an excess amount of sediment and other pollutants flushing into the water, higher concentrations will occur. This observation can help provide evidence of the dangers of increasing agricultural fields or stripping land of vegetation.

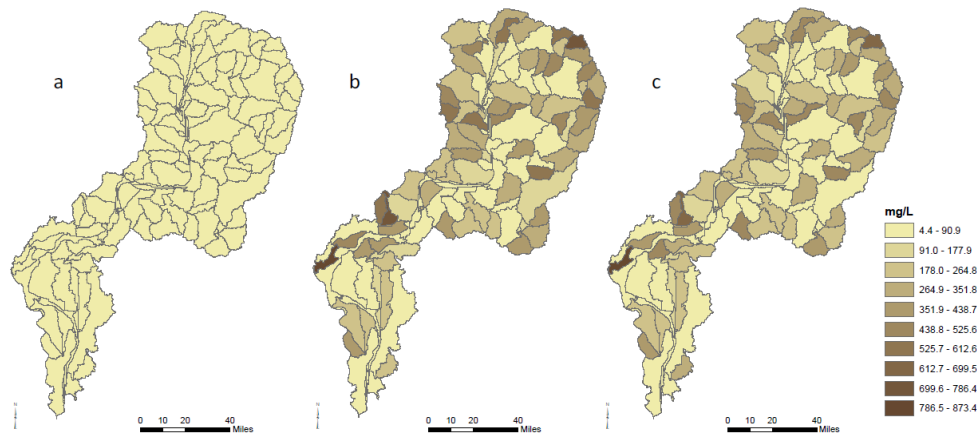


Figure 4. Suspended sediment concentration levels for 1988 (a), 2004 (b), and 2018 (c).

Analysis of the spatial patterns of total nitrogen load levels illustrates higher levels in the southern half of the watershed compared to the northern half in 1988. By 2004, total nitrogen load begins to increase from roughly 80 kilograms to 150 kilograms. Specifically, total nitrogen loads increase northwards close to the Mekong River. The spatial pattern of areas that increased in total nitrogen load are similar to the spatial patterns of changes from shrub or forest to agriculture (Oeurng et al., 2016). Then, in 2018, areas that maintained agricultural LULC increased even greater in total nitrogen load approximately from 105 kilograms to over 200 kilograms. Likewise, total nitrogen load continued to increase between 2004 and 2018 in the middle and southern regions of the watershed where agriculture continued to expand. Even in the northern half, total nitrogen load increases in areas that deforest into agricultural fields. Since synthetic fertilizers are known to be commonly used in crops such as corn, agricultural fields that contain these crops are more likely to generate more nitrogen (Millar et al., 2010). After the 2000s, farmers in Cambodia began to incorporate corn in their fields thereby potentially increasing the nitrogen levels in surface water (Shindo et al., 2003). It is important to note that throughout the 30 years, as settlements began to expand and migrate north along the Mekong River, agricultural LULC appeared in a similar fashion. This makes sense since most of the residents in Cambodia, specifically in the rural communities, mainly rely on agricultural practices for their income and livelihood.

As a result of the impact of increasing agricultural practices and urbanization between 1988 and 2018, the spatial pattern aligns well with that of areas which increased in suspended sediment concentrations and total nitrogen load throughout the 30 years. Therefore, the relationship between LULC, TSS concentration, and total nitrogen load help aid in understanding how LULC changes may impact surface water quality throughout time. From this project's results, it can be concluded that there is a need for management or close supervision in areas in the Lower Mekong River watershed which are undergoing heavy agriculture and urban expansion. If areas are to be transformed into agricultural fields or urbanized, special attention needs to be implemented or policy making is necessary in order to prevent negative impacts on surface water quality.

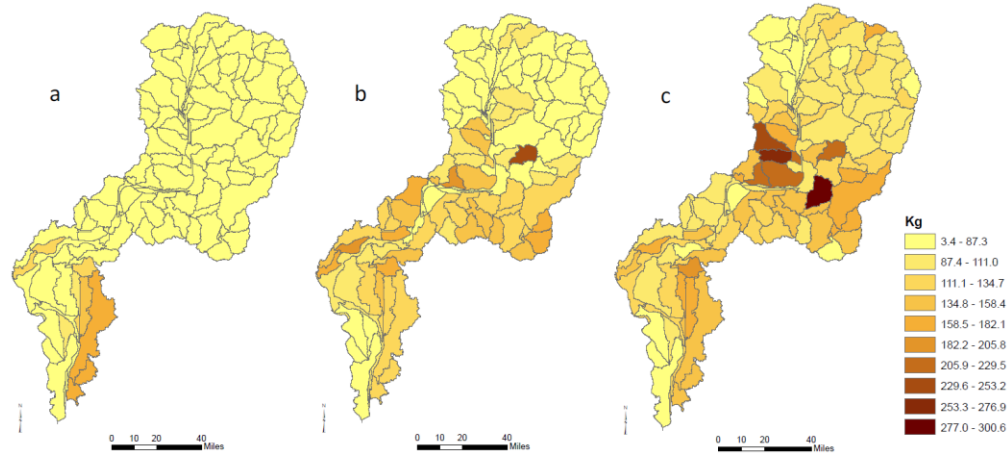


Figure 5. Nitrogen load levels for 1988 (a), 2004 (b), and 2018 (c).

### Conclusion

Through the use of OBIA, random forest classification, expert systems, and SWAT modeling, this research project was able to identify which LULC classes have impacted surface water quality the most between 1988 and 2018 in the Lower Mekong River watershed in Cambodia. The study shows that urban (+160%) and agricultural lands (+218.8%) increased, while forest (-62.9%) and shrub (-97.6%) decreased over the 30-year period. Since the inhabitants of Cambodia mainly rely on agriculture for their livelihood, settlements and agricultural fields both expanded in similar locations. The spatial patterns of increased levels in TSS concentration and total nitrogen load reflected the spatial patterns of areas transformed from forest or shrub to agriculture or urban. These areas mainly occurred in the central areas of the watershed. Due to the use of synthetic fertilizers in crops such as corn, this may be a potential factor contributing to excess nitrogen levels in the watershed. Also, the stripping of vegetated lands may have impacted the increased levels of TSS in areas that were transformed into agricultural fields or urban areas. This research project has opened the gates to a greater issue which needs attention in the Lower Mekong River watershed. The most vulnerable areas are ones that are mainly agriculture and urban, so these areas need to be researched further in order to discover the impacts of other pollutants not covered in this research. This study has shed light on potential mitigation policies that can be implemented in order to preserve the surface water quality for future generations of humans, animals, and ecosystems. These results have great potential to provide information that can be invaluable to sustainable watershed planning for present and future generations.

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# Effectiveness of a Social Media Discussion Board on Strength Training Adherence and Confidence in Novice College Aged Females

By:

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Mentor: Dr. Saori Braun

**Background/Purpose:** The purpose of the study was to examine the effectiveness of a private social media discussion board on strength training confidence levels/adherence in college females over a six-month intervention period. The secondary aim was to examine the effect of strength training on percent body fat and fasting blood glucose. **Methods:** A total of 13 female nursing participants were randomly assigned to 1) social media/exercise (SME; n=4), 2 exercise only (E; n=3); 3) social media only (SM; n=3); and 4) waitlist/control (C; n=3) after being recommended to reach the goal of twice per week of strength training exercises of all muscle groups. Participants in the SM and SME groups were placed into two separate closed chat groups and engaged in two weekly postings. All participants completed a weekly Qualtrics survey every Monday about confidence level and number of days of strength training during the previous week. E and SME groups were given a six-month resistance training program with a focus on the seven major muscle groups. **Results:** There was a significant increase in strength training frequency across all groups from baseline to week 1; however, no change in confidence from baseline to post-intervention. A significant difference existed in confidence levels between groups at Week 14. Question remains regarding whether or not the effectiveness of social media on strength training adherence changes depending on individuals' pre-established relationship prior to participating in a behavioral modification intervention.

## Introduction

In 2008, the U.S. Department of Human Services established a set of physical activity guidelines for the American population to improve and maintain physical fitness. The guideline recommends 150 minutes per week of moderate-to-high intensity aerobic activities and strength train the 7 major muscle groups (i.e., hips, shoulders, arms, legs, back, chest, and abdomen) at moderate to high intensity activities for 8-12 repetitions at least 2 non-consecutive days per week for 6 months (Loustalot et al., 2018). Strength training includes the use of free weights, weight machines, resistance bands, medicine balls, etc. The Centers for Disease Control (CDC) indicates that the percentage of US adults 18 years and older meet the minimum guidelines for aerobic physical activity is 51.7% and only 21.7% meet strength training guidelines set by ACSM (CDC, 2017). Furthermore, engagement in strength training is much lower in women than in men. Krueger, Carlson, and Kohl (2006), reported that 21.9% of men and 17.5% of women strength train two or more times per week. Furthermore, 34% of women ages 18 to 56 years old reported that they did not engage in any strength training (Hurley et al., 2018). Instead, women are choosing cardiovascular equipment over weight training equipment in fitness facilities (Dworkin, 2003).

Such disparities in resistance training between genders requires attention considering that a majority of current research shows how beneficial resistance training is on psychological, physical, mental, and social health (Bitonte, 2012; Blumenthal, Babyak & Moore, 1999; Cullinen & Caldwell, 1998; Deschene & Kraemer, 2002; Hessen, 2005; Minter-Jordan, Davis, & Arany, 2014; Salvatore & Marecek, 2010; Slade & Keating, 2011). For instance, resistance training can improve body composition by increasing lean muscle mass and strength via improved neuromuscular recruitment of muscle fibers and fiber hypertrophy, while reducing fat mass. There has also been substantial evidence showing the unambiguous effect of resistance training on insulin sensitivity and diabetes. In their 2006 article, Eves and Plotnikoff state that 3 months of resistance training lowers A1C levels from 8.8 to 8.2% due to an increase in lean body mass. An A1c test measures the percentage of hemoglobin (protein in red blood cells that carries oxygen) that is covered in sugar, or blood sugar levels (Mayo Clinic, 2018). They also mention that fasting triglycerides and LDL cholesterol levels were lower in the resistance training group versus non-exercising group in a 5-month study. Low density lipoprotein (LDL) cholesterol is a type of cholesterol that carries cholesterol particles throughout the body and can cause plaque build-up, creating hardened and narrowed arteries (Mayo Clinic, 2019). Moreover, over a 12-week period, resistance training lowers percent body fat and increases muscular strength (Cullinen & Caldwell, 1998). Weight training also minimizes the effects of numerous chronic diseases such as osteoporosis by improving bone density. In her 2011 article, Cawthon stated 26 million women and 14.4 million men had low BMD. Thus, the statistics highlight the importance for women to strength train. Wescott (2012), stated that engaging in resistance



training maintained or improved BMD by 1% per year. In a 2009 review, Going and Lauder milk concluded that weight training caused a 1 to 3% increase of bone in premenopausal and postmenopausal women. Other benefits of resistance training for college students includes a higher-grade point average, improved sleep quality, and enhanced mood (Bitonte, 2012). In their article, Salvatore and Marecek (2010) highlights how resistance training decreases feelings of body dissatisfaction and has the ability to minimize feelings of depression. Despite the extensive research verifying the value of resistance training, there still remains difficulties with exercise adherence amongst women due to various barriers.

Currently, research has identified barriers to exercise amongst college students. Considering the fact that the majority of habit-forming behaviors are created during one's college years, it is critical to establish a lifestyle that incorporates both aerobic and muscle strengthening activities prior to graduation (Linder, Harper, Jung, & Woodson-Smith, 2017). Acknowledging these variables can be valuable in addressing the solution to improving resistance training behaviors. Ebben and Brudzynski (2008) found that lack of time, decreased motivation, harder access to facilities, and lack of financial resources were the main barriers for college students. There are also more specific barriers related to gender. Keating et al. (2005) noted that females tend to focus on weight loss while males prioritize muscle gain when weight training. Thin-ideal internalization is based on stereotypes and general societal trends via gender roles and through the media. For example, women tend to be displayed as thin with minimal muscle mass (Rohloff, 2013). This visualization can be associated with a powerful stigma that coins the phrases "being bulky" with resistance training. Numerous media sources have promoted this idea of women who engage in resistance training will become "manly" and then venture outside of societal norms (Hurley, et al., 2018). Therefore, their research states that females tend to occupy more than half of the cardiovascular equipment in a gym versus males (Hurley et. all, 2018). Cardiovascular equipment permits women to change their body composition without venturing outside of societal norms (Craig & Liberti, 20007).

Research has begun to utilize web interventions to develop positive resistance training behaviors. Reasoning for this is due to the capability of the web at reaching large populations at minimal costs via accessibility and popularity. In their meta-analysis related to physical activity, Davis, Spence, Vandelanotte, Caperchione, and Mummery (2012) concluded that in the short term, an eHealth intervention greatly improved physical activity (PA). In adolescents and children, eHealth interventions have also improved PA levels (Lau, Lau, Wong, & Ransdell, 2011). The mediums utilized include cell phones, tablets, laptops, computers, and other mobile devices. According to Anderson (2015), 86% of adults between 18 and 30 years-old have smart phones, and 78% own a laptop or computer. Yet, eHealth interventions do have limitations. Drawbacks with utilizing an internet-based exercise intervention include minimal participation engagement and small sample sizes (Kohl, Crutzen, & de Vries, 2013).

Recently, social media has gained significant importance. In fact, 88% of young adults between 18 and 29 years-old use social media (Brackett, 2018). Within the U.S., Facebook is a leading website with 68 percent of Americans having an account and visit the site daily (Brackett, 2018). For example, Rote (2013) included social media as an intervention made to increase daily steps among female college freshmen. Since an inconsistency in evidence exists and there is a limited amount of knowledge regarding the effectiveness of social media on strength training adherence, future research is needed that utilizes social media in providing positive social interactions. Additionally, research should focus on providing a weight training program for individuals who are novice to using weight training equipment. Therefore, the purpose of this study was to identify the effect of a closed Facebook discussion group on resistance training behaviors in college-aged females. It was hypothesized that females in the Facebook group would develop more confidence and greater adherence to resistance training then the non-Facebook group.

## **Methodology**

### *Participants*

During the initial recruitment process, there were around 16 participants who expressed interest. But, 3 of those participants did not complete the initial assessment due to time constraints or not being able to make the initial assessment This left 13 participants participating in the study. Thirteen females (mean(  $\pm$  standard deviation) age:  $20.8 \pm 1.0$  years; body mass:  $68.3 \pm 12.5$  kg; height:  $165.2 \pm 5.7$  cm) who were not meeting the American College of Sports Medicine (ACSM) strength training requirements of two days per week with a focus on the seven major muscle groups for at least 6 months, were of sophomore or higher standing, and were currently admitted in the University of Eau Claire nursing program were recruited for this study. Throughout the 6-month intervention period, 54% of participants consistently completed the weekly confidence and adherence survey. (n=7). No participants dropped out of the study once the four groups were made. Refer to Table 1 for participants characteristics and baseline measurements of dependent variables. Participants were recruited through emails, word-of-mouth, and in class recruitment. Due to the small sample size and specific requirements, no exclusions were made during the recruitment process. Once admitted to the study, subjects were assigned into one of four groups: Social Media Exercise (SME) (n=4), Social Media (SM) (n=3), Exercise (E) (n=3), Waitlist/control (C) (n=3). Before the commencement of the study, ethical approval was granted from the University of Eau Claire (UWEC) Institutional Review Board. All participants were informed of the possible risks and provided consent before participation in the study.

	Mean	SD
Age (years)	20.77	1.013
Height (cm)	165.162	5.7378
Weight (kg)	68.338	12.5005
SBP	113.92	8.170
DBP	68.85	8.821
HR	70.54	8.743
LBM	47.938	4.8759
BMI	25.185	4.1549
PBF	29.100	8.8859
L_ra_	2.4869	0.34038
L_la_	2.4131	0.31608
L_trunk_	21.154	2.0723
L_rl_	7.2500	0.98997
L_ll_	7.2100	0.98620
VFA	92.915	49.2607

**Table 1.** Participant characteristics and descriptive statistics of baseline measures ( $N = 13$ ). Variables are: age in years, height measured in cm, weight measured in kg, systolic blood pressure (SBP) measured in mmHg, diastolic blood pressure (DBP) measured in mmHg, heart rate (HR) in bpm, body mass index (BMI) in  $\text{kg/m}^2$ , percent body fat (PBF) in %, segmental lean analysis of right arm (L\_ra) in kg, segmental lean analysis of left arm (L\_la) in kg, segmental lean analysis of trunk (L\_trunk) in kg, segmental lean analysis of right leg (L\_rl) in kg, segmental lean analysis of left leg (L\_ll) in kg, and visceral fat area (VFA) in kg.

### *Instrumentation and Testing*

**Weekly Confidence and Adherence.** An online survey was sent to participants via Qualtrics. Qualtrics is a university supported software developed from Qualtrics (Provo, UT). The survey contained 4 questions pertaining to 1) frequency of resistance training the previous week, 2) confidence level towards strength training from 1-10, 3) perceived greatest barrier to resistance training, and 4) ways that participants could minimize that barrier on their own. All 4 questions were fill-in-the blank and based on self-measurement.

**Confidence Scale (CS)** was a Qualtrics survey given during the initial and final meetings with participants. The survey had 6 multiple choice questions concerning confidence (not at all confident, little confidence, neither, somewhat confident, very confident) or importance levels (not at all important, slightly important, neither, somewhat important, very important) out of a 5-point Likert Scale. Questions were as follows: 1) What is your confidence level with exercising, 2) what is your confidence level at a fitness facility, 3) How confident are you with using weight lifting machines, 4) how confident are you with using aerobic exercise equipment, 5) How confident are you with using free weights (barbells, dumbbells, kettlebells, medicine balls, etc.), 6) How important is strength training to you right now. Then there were 3 open ended questions regarding the participants 1) negative and 2) positive experiences with strength training and 3) current barriers that they faced.



## Intervention Procedures

Within a week of being recruited, 10 nursing students were sent an email with timeslots where they could meet with one of the student researchers. After the 10 participants had been completing the study for 2 weeks, two more nursing students were added to the study. During the initial 15-minute meeting, participants met with a student researcher in the exercise physiology lab. There, multiple measurements were gathered: an In-Body, heart rate, blood pressure, and the CS. Once all assessments were completed, the first group was randomly divided into four groups: social media and exercise (SME), exercise only (E), social media only (SM), and waitlist (C). Once the initial meeting was complete, participants were emailed with instructions. All participants were required to strength train for a minimum of two days per week following the ACSM guidelines, either with the given program or on their own. The strength training program was developed based on the seven major muscle groups (legs, hips, back, chest, arms, abdomen, shoulders) developed by ACSM. Participants in the SME or E groups met with a student trainer for an additional 30-minute meeting and were given the same strength training program (shown in Figure 1) and had one-month check-ins for the entire 6 months. Furthermore, participants in the SME group or in the SM group, were added to a closed Facebook chat group. Concerning the weekly survey, the six questions were uploaded to the both SME and SM Facebook pages on Monday and Friday. The E and C groups had the WCAS survey sent via email. A quarter through the study, the methodology did change. The only questions posted to Facebook are those concerning non-exercise related things on every Monday and on Thursday, an exercise related question. On the following Monday of each week, an updated the weekly survey was sent to all participants with questions about barriers, amount of days exercised during the previous week, and confidence levels. The final assessments were completed at the end of 6 months and involved the same assessments as the beginning.

**Table 2: Full-body strength training program**

<b>Muscle Group</b>	<b>Exercise</b> ( <i>pick one from each category each lifting session</i> )	<b>Sets x Reps</b>	<b>Weight lifted (lb.)</b>
<b>Chest</b> (Pectoralis major/ minor)	<ul style="list-style-type: none"> <li>• BB Bench Press</li> <li>• DB Bench Press</li> <li>• Incline DB Bench Press</li> </ul>	3 x 12	
<b>Legs</b> (Hamstrings, Quadriceps)	<ul style="list-style-type: none"> <li>• DB or KB Deadlift</li> <li>• DB or KB Goblet Squat</li> <li>• DB or KB Star Lunge</li> <li>• Front Step-Up w/ Knee Raise</li> </ul>	3x 12	
<b>Back</b> (Latissimus Dorsi, Trapezius)	<ul style="list-style-type: none"> <li>• TRX Inverted Row</li> <li>• Cable Face Pull</li> <li>• Lat Cable Pulldown</li> <li>• Seated Cable Row</li> </ul>	3 x 8	
<b>Front Arms</b> (Biceps)	<ul style="list-style-type: none"> <li>• DB Bicep Curl</li> <li>• DB Hammer Curl</li> <li>• EZ Bar Bicep Curl</li> </ul>	3 x 10	
<b>Stomach</b> (Abdominals)	<ul style="list-style-type: none"> <li>• Stir the Pot</li> <li>• Horizontal Cable Chop</li> <li>• Heel Touches</li> <li>• Birdog with Progressions</li> </ul>	3 x 10	
<b>Shoulders</b> (Deltoids)	<ul style="list-style-type: none"> <li>• DB Upright Row</li> <li>• DB Lateral Raises</li> <li>• DB Shoulder Press</li> </ul>	3 x 8	

<b>Back Arms</b> (Triceps)	<ul style="list-style-type: none"> <li>• DB Overhead Extension</li> <li>• Triceps Cable Pulldown</li> <li>• DB Kick Backs</li> </ul>	3 x 8	
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### Study Design and Data Analysis

This study was an experimental design consisting of four groups: SME, SM, E, and C. The dependent variables in this experimental design was body composition, heart rate, blood pressure, confidence levels, and strength training adherence. All three variables were tested during pre and post assessments. Body composition was measured via InBody770 while HR and BP manually. Confidence levels and adherence levels were measured with the Weekly Confidence and Adherence Survey.

Statistical analysis was carried out using SPSS version 24.0 with significance set at  $p < .05$ . The statistical methods employed in the experimental design was a paired samples t-test which was used to compare confidence and frequency between the two groups. The first combined group was the one that utilized social media (SM) and SME) while the other combined group was the groups that did not have the social media intervention (E and C). were combined and then within-subject comparisons occurred through the paired samples t-test. A paired samples t-test was also utilized to compare confidence and frequency when all four groups were combined. An independent samples t-test was the other statistical approach used. Between-subject comparison analyses were made at each time point.

### Results

During the initial recruitment process, there were around 30 participants who expressed interest. But, 17 of those participants did not complete the initial assessment due to either not replying back to the recruitment email or already meeting the resistance training guidelines. This left 13 participants participating in the study. Throughout the 6-month intervention period, 54% of participants consistently completed the weekly confidence and adherence survey. ( $n=7$ ). No participants dropped out of the study once the four groups were made. Refer to Table 1 for participants characteristics and baseline measurements of dependent variables.

#### Strength Training Adherence Levels

Completing a statistical analysis through a paired samples t-test per group revealed no significant difference between the social media and no social media groups in confidence and frequency throughout the entire study due to the small sample size ( $n=7$ ) that answered the survey consistently through week 17. But, when a paired samples t-test was completed by combining all 4 groups and comparing pre versus post measurements levels to week 17 (time effect), there was a significant increase in the number of days participants resistance trained from baseline to week 1,  $-1.429 \pm 1.718$  with  $p = .070$ . The same results occurred when completing the independent samples t-test. Adherence levels did not change from baseline to week 17 for both groups.

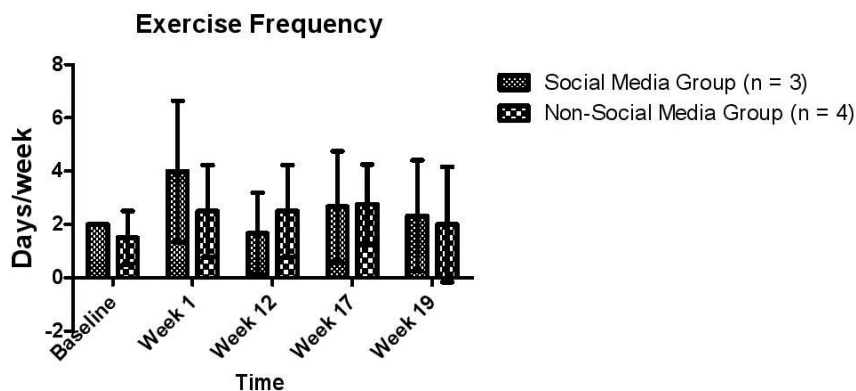
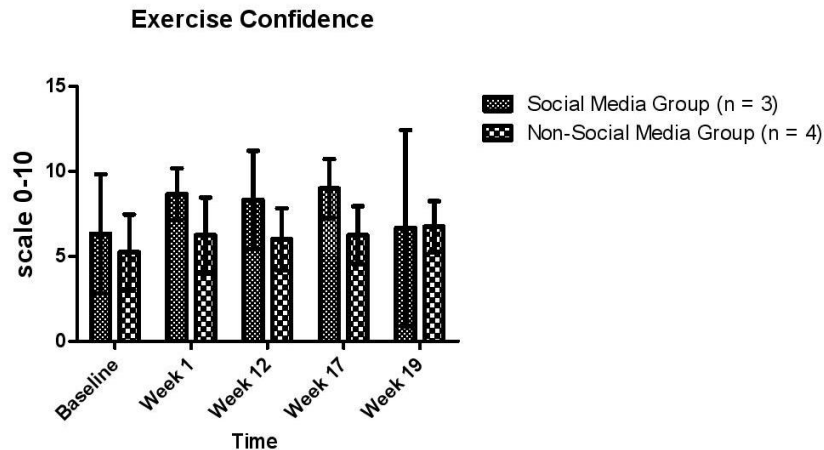


Figure 2: Paired samples t-test comparing frequency levels of social media group vs no social media group from baseline, week 1, week 12, week 17, and week 19.

### Confidence Levels

No change occurred in confidence levels from baseline to week 1 during the paired samples t-test per group. Furthermore, the paired samples t-test had no significant change from baseline to week 17. However, a significant difference in confidence from week 1 to 17,  $-1.714 \pm 1.704$  with  $p=.037$ , did occur when combining all groups and completing a paired samples t-test as shown in chart 1.



**Figure 2: Paired-samples t-test comparing confidence levels of Social Media vs No Social media group from baseline, week 1, week 12, week 17, and week 19.**

### Discussion

There is a gender disparity in resistance training compliance (CDC,2017). Thus, many young adult females are not experiencing the benefits that strength training can offer to improve their physical and mental health. Targeting younger populations of females could change this habit of avoidance and improve quality of life as they age. Utilization of social media is a key component considering how prevalent the usage is amongst younger generations. The aim of the present study was to explore the effectiveness of a 6-month social media and strength training intervention incorporating the usage of a closed social media discussion board and full-body strength training program with a focus on the seven major muscle groups in college females.

### Confidence Levels

Overall, results showed that confidence levels did not change significantly over time for both groups. Research has shown that utilizing behavior modification theories in physical activity interventions is beneficial (Beville, 2014). He utilized the Theory of Planned Behavior (TPB) and the Integrated Behavioral Model (IBM) to compare leisure time physical activity engagement in male and female college students. Results found that intention was the most significant variable to affect LTPA. This study defined the TPB as an individual's intention to participate in a behavior and is based on three components: perceived behavioral control, attitude, and subjective norm. The IBM builds off of this definition and includes self-efficacy. Self-efficacy is an individual's level of confidence to successfully engage in a behavior. Additionally, the IBM includes descriptive, which is an individual's ideas on what other's in their social circle are doing related to a certain behavior, and injunctive norms (Beville, 2014). Thus, the 2014 study concluded that both genders correlated intention as the main motivator for behavior engagement. So, researchers need to focus on improving an individual's intention to engage in a particular exercise. While this current study did utilize social media, it was concluded that there was no significant difference in confidence levels between groups. Beville (2014) had stated in their article that utilizing social media interventions, such as Facebook, would promote intention to engage in physical activity. Given the results of this study, this conclusion was not justified. But, utilizing social media interventions would be more beneficial if participants had a prior relationship with the other participants in the group or page. This is due to most on social media tend to engage in postings with friends or people that they know.

Along with the models stated above, Beville (2014) found that most of the female participants were in the Contemplation stage. The stage comes from the Transtheoretical Model of Behavior Change. This model is divided into 5 stages: precontemplation, contemplation, preparation, action, and maintenance (Prochaska & Velicer, 1997). The National Cancer Institute (2005) utilized this model in their study. They defined behavior change as a longer process, not just a simple change, and highlighted that utilizing this model could assist researchers with predicting behavior change. While this study did not specifically utilize this model, it could be assumed that most participants were in either the pre-contemplation, contemplation, and action stages. These assumptions are due to the Health Belief Model (HBM). This model utilizes 6 different concepts to promote behavior change; cue to action, perceived benefits and barriers, and self-efficacy were the concepts utilized in this study (Rimer, Glanz, & NCI, 2005). For cue to action, the usage of a social media chat group, the weekly Qualtrics survey, and the free full-body strength training program were employed. For perceived barriers- the weekly Qualtrics survey did provide a question concerning the individual participant's perceived barriers that week and what they could do to minimize. These two specific questions hoped to provide assistance to the obstacles the participants had by them identifying potential ways to eliminate them. Another way that combated barriers was the incentive of providing a 30 percent discount on the 6-month membership to the on-campus gym. Concerning the Facebook chat group, individuals were able to chat with other participants and develop an accountability system throughout the entire 6 months. For self-efficacy, participants in the exercise groups were provided with a full body strength training program and monthly check-ins to combat the uncertainty of developing their own resistance training program for the entire 6 months. The percentage off of the gym membership could also be applied to self-efficacy (Rimer, Glanz, & NCI, 2005).

Social Cognitive Theory (SCT) is another important theory to discuss. SCT states there are three factors that affect behavior change: self-efficacy, goals, and outcome expectancies (Rimer, Glanz & NCI, 2005). Furthermore, the book mentions that these can be broken down into 6 variables: reciprocal determinism, behavioral capability, expectations, self-efficacy, observational learning, and modeling. According to reciprocal determinism, the relationship between environment, behavior, and personal factors influences behavior. Considering this study, utilizing social media and the percentage off a gym membership provided an atmosphere where participating in strength training could be easier due to influencing positive behaviors and changing their environment. Expectations, behavioral capacity, and observational learning relate to skill mastery and modeling of a behavior. Utilization of the student trainer and the strength training program would be under these two variables because participants were offered assistance with questions that they had about their program and the amount of time spent doing the study provided time to become more confident with strength training. However, future research may have more success by posting links to workouts on the social media page or through emails to offer credible exercise role models. Reinforcement was provided through the gym membership discount (Rimer, Glanz, & NCI, 2005).

### *Adherence Levels*

Results from this study showed adherence levels being significant during the initial week of training to week 1 but, slowly became less significant as time wore on. Williams and French (2011) reported that using strategies for physical activity promotion and improvement in self-efficacy would be beneficial. Such strategies included offering small group exercise classes and weight room orientations. Furthermore, Baller (2010) studied the influence of on-campus fitness facilities on physical activity engagement in inactive and active students. Both extrinsically and intrinsically motivated students reported utilizing the facilities. This study utilized all of the above in strength training promotion. All participants were offered a percentage off on the-campus gym membership yet, not all took advantage. Moreover, participants in the exercise groups were given a free full-body strength training program with one-month follow-ups with a student trainer. But even with these added incentives, adherence levels were not significant throughout the 6 months. Thus, using behavior modification theories and maintaining motivation levels should prove beneficial.

### *Study Limitations*

This study did have limitations that do need further discussion. First was the mid-study methodology change. The weekly surveys went from being posted on both the Facebook chat groups and through email to only Qualtrics. This change in methodology did change how data was collected and could have created skewed data. Future studies should implement software similar to Qualtrics to make data collection easier and to promote adherence to the surveys at the beginning of the study.

Another limitation to the study was the minimal responses to the weekly survey and that the survey was based on self-reporting. Throughout the entire intervention, only 7 consistently answered the Qualtrics survey. Participants were sent the survey on the same day every week and were alerted through email yet, this still led to minimal responses. This lack of answering could be due to the student's schedule and due to the amount of emails that they received on a daily basis. Even if they knew the email was coming, it could have become hidden within the other emails. Thus, instead of the email being easily accessible and in clear view, students would have to dig for the email. So, researchers should focus on making software like Qualtrics more accessible, if utilizing an email notification system. More success may be achieved with usage of an app; an on-phone exercise app to record exercise engagement in a

timely fashion. This app would minimize the number of steps in self-reporting activity participation by requiring immediate feedback. Coincidentally, this app may eliminate the self-reporting problem if the app was associated with an activity monitor, such as a Fitbit.

A small sample size and only recruitment from one student population are two other limitations that need to be discussed. Relating to the small sample size, many replied to the initial recruitment emails but only a select few set-up assessment times and met the inclusion criteria. Researchers should have larger sample sizes to have better data. Since this study only recruited University of Eau Claire nursing students, this data can only be applied to a small student population. To obtain a more accurate representation of the amount of college females participating in resistance training, a more diverse population should be recruited.

Considering the abnormal weather, environmental factors was another limitation. The excess amounts of snow inhibited transportation to the gym on multiple days. This created barriers to resistance training and set back the participants obtaining the wanted behavior. Two more environmental factors were winter break and school work. During mid-study, adherence and confidence across all groups dropped drastically due to the student's not being on campus and being with family. Nursing students are required to be in clinicals for almost 8 hours multiple times per week and thus, many would choose sleep or school work over resistance training. Therefore, researchers should take into consideration environmental factors when implementing exercise interventions.

Concerning the full body strength training program, participants were not observed when completing the program throughout the week. This could develop inconsistencies in the two groups who did receive the strength training program because participants may have completed the program differently; based on personal preference. Additionally, there was a limitation with the lack of similarity in gym memberships. This could have caused a barrier in following the strength program; if the strength training equipment was not available. Future studies may have better adherence to program if participants were observed when completing the program.

### Conclusion

Results from the study concluded that social media did not have a major impact in behavior change. This could be due to the participants not knowing each other prior to study engagement. Hypothetically, one tends to befriend those that they know on social media and engage with posts made from friends or family more than those they do not know as well. But, those in the social media group did tend to have higher confidence levels from week 0 compared to week 17 even though the data was not significant. The small goal setting of meeting the resistance training guideline and completing the weekly survey may have initially induced motivation to engage in resistance training among college female. Future research can focus on setting up an accountability partner using a buddy system to increase exercise adherence among college students. Further research needs to be completed regarding using behavior change theories to develop interventions with high subject engagement

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