

# Adaptations

The University  
Honors Program

Volume 18, Spring 2021

# *Adaptations*

## *A Journal of Exploratory Research and Analysis*

The articles published here reflect the Capstone Research projects completed by graduating seniors in the Stanislaus State University Honors Program. They present projects conceived from personal academic interests and mentored by faculty members familiar with the research and scholarship driving these efforts of discovery.

Like their undergraduate peers across the country and around the world, Stanislaus State Honors students designed, completed, and published this work in the context of the COVID-19 pandemic caused by the spread of the SARS-CoV-2 virus and its variants. When classes started on January 27, 2020, and students gathered in HONS 3990 to begin preliminary research on their projects, the 1,000 bed Huoshenshan hospital in Wuhan city, China, was on day 4 of its record-breaking 10-day construction, approximately 2,829 COVID-19 infections and 82 deaths had been reported, and the first quarantine orders had been issued in Hubei Province. As students' preliminary research coalesced around a topic and they began planning data-collection strategies, community spread and lockdowns in hotspots across Asia, Europe, and even on cruise ships made it clear that the virus would have a far-reaching, devastating impact. By the midpoint of the semester, as students began submitting drafts of their preliminary research methodologies, the impacts came into sharp and personal focus for those of us in the CSU when the World Health Organization (WHO) declared a pandemic on March 11, 2020, and the Governor of California issued the first stay-at-home order on March 19, 2020. Research projects, and University life as we knew it, "pivoted" on-line—and stayed there.

Students completed the remainder of their Capstone Project and, in most cases, their undergraduate education, on-line and off-campus.

They presented both their preliminary posters and final research findings in Capstone Conferences held virtually. Projects that normally involved long days in the lab, braving the heat and sun on Warrior Wednesdays to collect survey data in the quad, or hours dedicated to observational studies in a wide variety of settings were redesigned to focus on theoretical or computational inquiries, data that could be collected via on-line surveys or Zoom interviews, or topics that focused on responses to the pandemic itself. While the story of the pandemic is often told in numbers (e.g. the WHO reported 2.7 million cases and 205,650 deaths world-wide when students presented their preliminary posters in the 2020 Capstone Conference and 145.3 million cases and 3.2 million deaths when they shared their final results in the 2021 Capstone Conference), individual experiences are more varied and nuanced. Many students lost family members or friends; others lost much-needed income as the lockdowns stretched on; all lost the college experience they expected to have.

But, just as vaccination campaigns, preventative measures, and new treatments raced to outpace the virus and its variants, so too did Stanislaus State Honors students find new and innovative ways to adapt to ever-changing conditions. They pioneered new methods to gather data virtually, dug deep to finish projects with limited faculty support, and even built required research equipment at home. We are very proud of the research published in this year's *Journal of Exploratory Research* not only because of the knowledge and insights produced, but also because of the resiliency, determination, grit, and ability to rise in the face of unimagined challenges that the completion of each and every project represents. We salute the authors and hope you will join us in recognizing their achievements.

---

### **The Honors Capstone Project**

*Seniors in the Honors Program are encouraged to tackle complex problems using methods, insights and knowledge drawn from relevant disciplines. Honors Program faculty and capstone research mentors offer critical feedback and guidance along the way. The main objective is for students to explore, gather, and analyze information effectively, and to share their reflections on the implications of what they have discovered. Group discussions help to promote thoughtful questioning and critical analysis. The primary goal is to communicate knowledge, judgments, and original perspectives cultivated on the basis of careful inquiry, exploration and analysis.*

---

## Acknowledgements

Special thanks to Mr. Tim Held (Faculty Research Librarian), Dr. Jamila Newton (Biology), Dr. Suditi Gupta (Psychology), Dr. Steve Arounsack (Anthropology), and Dr. Ellen E. Bell (Anthropology) for providing substantial critical and editorial feedback in HONS 3990, HONS 3500, HONS 4200, and HONS 4960 to students working on 2012-2021 Senior Capstone Research Projects.

### Faculty Teaching in Honors or Serving as Research Mentors, 2020-2021

|   |  |
|---|--|
| Arya Alami (Kinesiology)                    | Amanpreet Manchanda (Chemistry)            |
| Ian Albright (Philosophy)                   | Renee Mattos (English)                     |
| Steve Arounsack (Anthropology)              | Maureen McCorry (Honors)                   |
| Ralph Becker (Social Sciences)              | Sari Miller-Antonio (Anthropology)         |
| Ellen Bell (Anthropology)                   | Brian Morsony (Physics)                    |
| Sarah Bissonnette (Biological Sciences)     | Chris Nagel (Philosophy)                   |
| Larry Busk (Philosophy)                     | Dana Nakano (Sociology)                    |
| Tom Carter (Computer Science)               | Jamila Newton (Biology)                    |
| Dave Colnic (Political Science)             | Grace Paradis (Psychology)                 |
| Andrew Conteh (Politics & Public Admin.)    | Jennifer Peltier (Nursing)                 |
| Jim Cook (History)                          | Elaine Peterson (Economics)                |
| Jennifer Cooper (Biological Sciences)       | Jason Pourtaverdi (Criminal Justice)       |
| Kelly Cotter (Psychology)                   | Brent Powell (Kinesiology)                 |
| Scott Davis (English)                       | Richard Randall (Political Science)        |
| Jason Emory (Psychology)                    | Chad Redwing (Honors)                      |
| Steven Filling (Accounting and Finance)     | Stephen Routh (Politics & Public Admin.)   |
| Deborah Forester (Psychology)               | Scott Russell (Chemistry)                  |
| Garrick Garcia (Psychology)                 | Moteczuma Sanchez (Ethnic Studies)         |
| Tahi Gnepa (Mgmt., Operations, & Marketing) | Arnold Schmidt (English)                   |
| Suditi Gupta (Social Sciences)              | Sebastián Sclofsky (Criminal Justice)      |
| Julie Hall (Psychology)                     | Gökçe Soydemir (Accounting and Finance)    |
| Ayat Hatem (Computer Science)               | Harold Stanislaw (Psychology)              |
| Tim Held (Library)                          | Koni Stone (Chemistry)                     |
| Erin Hughes (Politics & Public Admin.)      | Kyle Stubbs (Communication Studies)        |
| Wura Jacobs (Kinesiology)                   | My Lo Thao (Biological Sciences)           |
| Heather Jarrell (Anthropology)              | Richard Wallace (Anthropology)             |
| Daehee Kim (Computer Science)               | Jake Weigel (Art)                          |
| Xuejun Liang (Computer Science)             | Gary Williams (Psychology)                 |
| Jori Lindley (English)                      | Wing To (Physics)                          |
| Ryan Logan (Anthropology)                   | Katie Wiskow (Psychology)                  |
| Victor Luevano (Psychology)                 | Jesse Wolfe (English)                      |
| Therese Lunt (History)                      | Pamela Young (English)                     |
| Adamou Fode Made (Computer Science)         | Karen Zandarski (English)                  |
| Mirta Maldonado-Valentin (English)          | Nan Zhang (Mgmt., Operations, & Marketing) |

---

#### A Publication of the CSU Stanislaus University Honors Program

California State University, Stanislaus  
One University Avenue  
Turlock, CA 95382

Cover Image: Jade Gardea  
Journal Design: Ellen Bell & James Tuedio

Tel. (209) 667-3180  
email. [honors@csustan.edu](mailto:honors@csustan.edu)  
url. [www.honors.csustan.edu](http://www.honors.csustan.edu)

This publication was supported by funding from the  
**Stanislaus State Office of the Provost**

Individual Authors Retain all Copyrights  
**May 2021**

all rights reserved



*Table of Contents*

**Anxieties: Gender Preference in The Picture of Dorian Gray & The House of Mirth**

*by Esmeralda Acatitla*

**Modeling Short Gamma-Ray Bursts as Structured Jets**

*by German Astorga*

**Racialization: How Does It Affect Latinx Immigrant Students?**

*by Aurora Ceja*

**Will the Electrodynamic Screen Cleaning Method be Effective in Stanislaus County?**

*by Ryan De Los Santos*

**The Impact of Trauma-Informed Education Practices on Combating Inequity in Schools**

*by Megan Dean*

**The Effects of the Flipped Classroom Teaching Method:**

**How it Impacts Motivation, Performance, and Satisfaction in the Classroom**

*by Timea Friesen*

**Why Does Female Genital Mutilation Continue to be a Social and Cultural Drive?**

*by Cristal Fuentes*

**The Victorian Roots of the Graphic Novel**

*by Colin Gage*

**Speculation on the Future of Moore's Law and Analysis of Business Proceedings Within the Microprocessor Industry**

*by Abram Galvez*

**The Effects of Anxiety Reducing Coping Mechanisms on Nursing Students' Test Scores**

*by Farhat Khairzadah*

**Eating Disorders and their Lasting Effects in Competitive Athletes**

*by Rachel Klopher*

**Diverse Coping Strategies for COVID-19 Related Stressors**

*by Lisa Lewis*

**ABA Training via Telehealth for Caregivers of Children with Autism:**

**A Review of the Literature**

*by Elizabeth Luna*

**Modesto's Housing Problem: Growing Population, High Cost, Difficulties in Obtaining Building Permits and Less Construction**

*by Abdulla Mammadsoy*

**Computational Docking of Potential Drug Inhibitors of SARS-CoV-2 Main Protease**

*by John Molthen*

**The Effects of Resistance Training on Chronic Low Back Pain:**

**Walking Interventions vs. RT**

*by Navjot Nahal*

**How School Type Influences Enrollment and Preference**

*by Carley Newbill*

**The Effects of Attentional Focus in Fine Motor Skill Learning**

*by Georgina Orozco*

**Am I Worthy? The Relationship between Weight and the Perception of Intelligence, Perceived Confidence, and Perceived Relationship Status**

*by Tawny Ortega*

**The Impact of Companion Animals on the Development and Health of Children**

*by Lauren Piro*

**Forensic Anthropology in Latin America: Examining Methods of Human Identification**

*by Lourdes Ramirez*

**Evaluating the Doctor-Patient Relationship and How it Affects Cases of Obstetric Violence**

*by Brittaney Rigby*

**Estimating a Minimum Income Level for Local College Students**

*by Marcus Ruddicks*

**The Role of Trust and Rapport in Teaching**

*by Malika Shoker*

**The Significance of the Dark Figure of Crime: Analyzing Unreported Violent Crime Statistics**

*by Yesenia Solorzano*

**Forensic Anthropology in Latin America: Examining Methods of Human Identification**

*by Catarina Sousa*

**Stress from Side Effects Found in Participants on Antipsychotics**

*by Sabrina Stephens*

**Investigating the Role of Inaccurate Diagrams in Student Misconceptions about Plant Metabolism**

*by Jair Torres*

**Teaching Robots Biologically Inspired Tasks**

*by Emma Van Hoogmoed*

**Risk Behaviors Among Overweight/Obese U.S. Adolescents:**

**An Examination of the 5-2-1-0 Recommendations and the Impact of Individual Factors**

*by Guadalupe Villanueva*

**Human Dignity v Civil Liberties How Israeli and American Supreme Courts Handle Speech**

*by Zephan Wood*

# **Effects of Trait-Anxiety and Mindfulness on Female Sexual Functioning**

*by Kerry Young*



# Author's Social Anxieties: Gender Preference in *The Picture of Dorian Gray* & *The House of Mirth*

Esmeralda Acatitla Velazquez\*

B.A. Candidate, Department of English, California State University Stanislaus, 1 University Circle, Turlock, CA 95382

Received 16 April 2021; accepted 20 July 2021

---

## Abstract

The rise of the LGBTQ+ community has become extremely popular today. Supporters claim that these individuals have existed in our society, only gone into hiding because of social circumstances. The Victorian society was not as welcoming. They held on tight to Christian values and pressured individuals to meet their social roles. Therefore, arousing fear and anxiety. The purpose of this study is to explore the novels of Oscar Wilde, *The Picture of Dorian Gray*, and Edith Wharton, *The House of Mirth*, to illustrate hidden gender preferences when parallel to their characters. Authors consciously or unconsciously inject themselves into their creations to reflect their desires. Many argue that self-authorship does not exist because characters come from imagination, making them a fictional experiment rather than something real. A writer cannot write what they did not experience, understood, or thought. I expect that the writer's social environment influences their writing, and writers influence their characters.

*Keywords:* self-authorship, gender preference, Victorian society, LGBTQ+ community

---

## Introduction

Previous research has proven that issues related to the negative impacts of social cultures, such as oppression and obligation, have altered the way individuals express their sexuality. In more detail, earlier research shows that gender preference is hidden in the novels of Oscar Wilde's *The Picture of Dorian Gray* and Edith Wharton's *The House of Mirth*. The society from the author's era differs from that of the modern world because it held on tight to Christian principles and values. This heteronormative society was very manipulative, constraining, and pressuring because it forced people to follow normalized social roles. Homosexuality during the British Victorian was thought to be associated with prostitution, criminology, and those of low ranks (Gagnier, 1991, p.71). An individual identified as a homosexual was attacked both physically and mentally. Although Wilde's and Wharton's novels and lives took place during different time frames, both periods demonstrated the heterosexual culture<sup>1</sup> that rejected and denied anything otherwise. Ignorance and hatred blocked society from accepting other gender identities; therefore, leading authors and characters in their novels to hide their real self (Gomel, 2004, para.3). The disadvantage of the authors comes with the issue of authorship<sup>2</sup>. Past research incorporates evidence of how the author's experiences impact their works of writing; therefore, the personas in their novels are also affected by their social experiences. This complex situation that is embedded in the field of literature portrays important connections. It is a study of effort to provide and extend research with regards to the practical gender fluidity following the effects of societal pressures on the individual's sexual identities and life. This succeeding literature is better to use to understand the

possible influences society has on gender identities.

## Background

Gomel's (2004) study states that the self-authorship theory would allow us to understand the relationship between the author and their written works. This presentation reveals the personality of the real-world author--even if they are not aware, known as the textual phantom<sup>3</sup>. Such as it is like a ghost who affects the body or object it takes over. A discussion between Sir Arthur Conan Doyle and his challenger, C.W.I, to demonstrate that characters are no different from their authors. The characters portrayed in *The Picture of Dorian Gray* impersonate their creator, Oscar Wilde. When examining the text of the novel, Gomel pointed out that there is a parallel between the author's identity and their characters. Therefore, Gomel's self-authorship theory supports that connects the character's identities to their authors. Wayne Booth's comment supports this because he states how Wilde's novel illustrates a real man (2004). A self-written piece can reflect the characteristics of the writer, as a painter to its piece of art.

Nakjavani's (1981) study reports that the literature theory of phenomenology opposes the concept of authorship. Much of the connection between the author and the characters is the view of an arrangement rather than a relationship. Indeed, some suggest that the characters were often structuralized rather than thought up. It's known that literature has its own set of rules to follow rather than replying to one's thoughts, expectations, and criticism. Others point out that this is not entirely true. Wilde says, "Life imitates Art far more than Art imitates Life" (Wilde, 1998, p. 254). By producing himself in his work, Wilde

---

\*Corresponding author Email: [eacatitlavelazquez@csustan.edu](mailto:eacatitlavelazquez@csustan.edu)

<sup>1</sup> Heterosexual culture is a social structure with the belief in relationships with the opposite sex, emotionally, socially, and sexually.

<sup>2</sup> Authorship is defined as a physically independent author who reflects themselves into their text, with or without being aware of it.

<sup>3</sup> Textual phantom is a relationship between the writer and their text.

shows his viewpoints and hidden gender identity, causing negative scandals and trials about the unresolved plots in the novel.

The aspects of Gomel connect to the interpretation of Carroll's (2012) study where she presents the society in *The Picture of Dorian Gray*. A place where art is viewed as unmanly, weak, or even as degenerated with homosexuality. This attracts the attention to social anxieties, provoking a replacement of direct clues to their real forms of identity that link the author to their production. When people find out that Wilde is producing homosexuality in his novel, they begin to question his gender identity, causing harmful scandals and trials. This fictional text turns against the body, and the dangers of pursuing the ideal self-take place in the Aesthetic Movement<sup>4</sup>, known as Aestheticism, where the human body is limited, only being led by a soul (Gomel, 2004, para.15). Therefore, this movement serves as a counterargument to the oppressive forces that society implies in individuals. It supports the connection between the characters and authors. Carroll found certain sets of characteristic behaviors that involved personality and cognitive psychology by considering Darwinism<sup>5</sup> (2012). It shows the importance of the ever-changing environments where human nature emerges from the individual's values and depicts the subject's mutual relationship to the author. The three main characters, Basil, Lord Henry, and Dorian, develop hidden feelings for each other. Dorian is Wilde's secret soul of desires while Basil represents his artistic image, and Henry his class standard as an aristocrat (Wilde, 1998, pp. 12-13).

The concepts of Carroll attach to the interpretation of Tuttleton's (1982) study that proves how society's pressures on the individual self and self-aspiration can relate to the real world. The books, *The Picture of Dorian Gray* and *The House of Mirth*, have sensual content such as depicting the beauty in both men and women, pointing out homosexuality. Today's society is more open to various gender identities, but not globally. Nowadays, there are some hidden gender identities; therefore, the characters and their times are important to consider. By utilizing the character's behaviors, such as that of Dorian Gray and Lily Bart, similar variables are found upon a complex study of the sameness and differences in their generation to the real world (1982). As the characters turn away from the traditional viewpoints, they begin to explore their individuality and prioritize their values. The results of social pressure increase the threats to self-image and gender identities. This heterosexual atmosphere consists of same-sex feelings in the images of sensuality, male and feminine beauty, the character's relationships, and sexual fidelity. Wharton began writing novels after her marriage, when she had a nervous breakdown, and writing became her therapy. This shows that Wharton wrote parts of herself in her novels.

Fritz's (2013) study reports the artistic or performed nature of the self in various places. Some of

these "real" identities the characters display is the view as a fictional experiment of the author rather than a real thing. Indeed, it leads some to think that Wilde was interested in the imagination rather than the authentic self. Due to the social consequences, individualism brings about. Others point out that the experiment seems artificial. Wilde says, "This result not merely from Life's imitative instinct, but from the fact that the self-conscious aim of Life is to find expression, realize that energy" (Wilde, 1998, pg. 254). Therefore, Wilde shows that compassionate ties are a personal responsibility for progress in life.

Davis' (2013) study declares that the environment plays a huge role in the individual's outlook on sexual identity. He observes the effects that come from the exploration of the self, the individual's knowledge and thoughts. By diving into the features and characteristics of the individuals in the novels, he finds a connection between the "mind, body, and environment" (55). Qualities of masculinity are part of social influence and pressure affecting the character's sexual identities meaning that this factor should be included in analyzing hidden genders between the writers and society. Wilde's self-image dives into the empathic human ties which create personal responsibility (Wilde, 1998, p. 32).

Mehaffey's (1994) covers the look on historical issues that point out sexuality components in Wharton's text *The House of Mirth*. Desire connects and manipulates the gender of sexual metaphors. Textual evidence shows the position of women, how they have two sign-values such as in their father's name and market exchange. Lily's, the main character, virginity makes her superior to Bertha who functions as an exchange of desire. In their society, men are the determining factors, implying that women are seen as inferior objects to the male producer. The needs and desires of men promote homosocial in differences in earnings. This study's limitations are due to the focus on gender, sexuality, and class in the characters (1994). It does not consider the author's individual or social challenges that lead to her hidden gender identity. However, authorship provides Wharton's position as a feminist who opposes sexuality in place of the market because, like Lily, she refuses a desire for gender status. She desires for "her fluid sense of self" in "a room of her own" (Von Rosk, 2001, p. 328). Lily, the main character in Wharton's book, was seen as purely superior to Bertha, who was impure. In their society, men are the determining factors, implying that women are viewed as inferior objects for manipulation.

Mehaffey's idea of Wharton's identification further develops into the concept of environment in Singley's (2003) study that shows the balance between faith and reason in nationhood during the 19th-century. By providing details of how the French people stood together in pain and suffering during the reign of Germany, gave way to the significance of nationhood. By comparing America to France in terms of values and teachings, Americans focus more on securing materialistic values and

<sup>4</sup> The Aesthetic Movement, mid-19 century through the 20th century, challenged the Victorian traditions of the Christian ethos of good faith.

<sup>5</sup> Darwinism, behavioral genetics in species' natural evolution, turned into meaningful patterns.

France on honesty and respect. Wharton stepped out of the selfish American culture to find alternatives, nationalism and acquired a global perspective that protected her from modernity, from following a standardized life. In her book, *The House of Mirth*, she expresses cultural value through the identities the characters adopted. Lily, a character, relied more on the natural selection of people and their identity; therefore, moved away from tradition and a connection to her nation (2003). This study implies that culture in the 20th-century is changing and still slowly developing to connect borders. In other words, there was no dominant race or gender but shared humanity.

Overall, Singley and the rest of the authors add up to Orlando's (2017) study about the disconnection between art and morality. Every artistic mind should be connected in some way throughout time, whether matching or developing something better. Wilde was a man more socially connected to women because he would rather be talking and entertaining the world of art than going out to hunt games or play cards. Wharton picked up on the invitation and influences that Wilde began when letting women join the circle of artistic men. Wilde believed that women were natural beings in the literature and arts. He was blamed for living a more emotional life than a real one, to the point where he would think art was useless. Wharton's *The House of Mirth* showed the social classes depending on the interior of people's places, such as the covering of books and how many took for a beautiful appearance. People are influenced by their environment, whether it is an art in their homes, as in Wilde's and Wharton's case (2017). Without the connection to our environment, our society would be divided, and ignorance would spread covering the forms of beauty and potential in art.

The lack of considering hidden gender identities, and the reports that fail to include the author's link to current literature was the main point for this study-- to include the pressures of society interconnected males and females. With this current research, it is hypothesized that there are social pressures that led writers to hide their real identities in literature. Authors wrote about their experiences or longed imagination; therefore, I expect my results to bring forth a parallel to how society played its role in the characters and writers of the novels. Wilde should be compared with Wharton rather than someone else because they both are escaping the pressures and burdens of social obligations. If this is proven to be true, it could give a foundation of information for future research in the effects and influence of society on the author and their text regarding gender fluidity with insights to hidden gender identities in the novels.

## Methods

Experiments and non-experiments are idioms used for the sciences and social sciences, where they used surveys or subjects for testing out their hypothesis. In my case of literature, I conducted interpretations to uncover the most important concepts and connect the literature's context with that of its authors. The use of primary and secondary sources helped to answer my research question. To show that the social pressure of the 19th-20th century

affected the characters and their author's gender identities, I used the evidence in the novels themselves. Literary criticism discussions were quite useful as well. In Edith Wharton's *The House of Mirth*, I investigated the character named Lily and other married women who were subjected to gender roles. Wharton was known to have some lesbian affairs after being married for years. In Oscar Wilde's *The Picture of Dorian Gray*, the three main male characters developed feelings for one another. Wilde was secretly involved in an affair with another man while married.

I analyzed some works of Wilde, *The Picture of Dorian Gray*, and Wharton, *The House of Mirth*, through various techniques and methods of criticism from other scholars with similar perspectives. A three-layer outline of my main theories used both the primary sources, autobiographies, interviews, or letters, and secondary sources, online databases, to investigate my hypothesis in-depth. The first section drove into the social gender identities and pressures during the mid-19th century to the 20th century. For this section, I searched online for Victorian homosexuality and found evidence in the texts to compare and connect it. The second concept dealt with gender fluidity and its' the beauty of the mind, body, and atmosphere. In this part, I searched online articles depicting sensual content in a homosexual context. The third theory laid on the concept of authorship and how it handled the pressures of society in their novels. For this piece, I read criticism books such as "women and Wilde" and "men and Wharton" for deeper comprehension; as well as evidence in the novel themselves and online discussions. If gender identities were exposed to social pressures, I explained the conditions.

The type of research design that I applied to my research question was a qualitative design with an approach to phenomenology and textual analysis with some rhetorical criticism. Rhetorical criticism allowed me to measure my operationalized theories and concepts. I used the library's databases, such as MLA Biography and One Search, to reveal the gender fluidity in the authors to their characters. They discussed the role of society and revealed the parallel between the author and their characters. The connection to real-life was effective through literary analysis of publications, such as the novels and online interpretations. These primary and secondary sources that showed the social pressures, and the anxiety of the individual, led to hidden gender identities in the novels. This exploration of the personal life of Wilde and Wharton provided connections to convince my reader that my observations were relevant.

## Results and Discussions

Experiment and non-experiments are idioms used for the social sciences and sciences but in my literary case, I found interpretations that uncovered the main connections between the writers and their context. My research design examined both Wilde's and Wharton's experiences as they consciously or unconsciously wrote about a life they longed for. The authors showed the same social pressures disguised differently due to their slightly different time frames. I found scholarly journals, articles, and critical essays from databases for my data. This exploration

provided connections to convince my reader that my observations of the personal life of Wilde and Wharton; as well as society's pressure on their lives and works are important.

There were limitations in criticism analysis, such as the lack of communication since interpretations varied in meaning. The authors were another limitation because some believe that Wilde was not a good choice for a believer in the actual self. Even if the author demonstrated an artistic self, my point showed that society played a role in their hidden gender identities. Wharton did not have enough critiques or evidence on her sexual orientation, but her novel served as evidence. I found some hidden gender identities that revealed the true implications of Wharton's feminist position that opposed the desire for gender status (Mehaffey, 1994). It showed how her characters were objects to men; therefore, it pointed out society's pressures and flaws. It led to individuals hiding their gender identities. Also, it showed that there was a connection between the individual and the actual world (Tuttleton, 1982). The behaviors of society influenced a similar outcome to that of the characters and their times.

The literature theory of phenomenology went against the theory of authorship, but most authors created their own rules. Authorship linked to my research question proved that the author is connected to their textual works (Gomel, 2004). A writer cannot write about something they have not experienced or thought of, so there is bound to be a connection with their writings. Simply, what influences the writer was reflected in what they wrote, therefore, we saw how social pressures took a major role in the development of one's sexual identities. The social anxieties of the characters in *The Picture of Dorian Gray*; especially, of Dorian whose anxiety showed in his self-portrait (Carroll, 2012). The society in which this novel took place is during the Aesthetic Movement, where traditional Christian ideas were being challenged, such as art seen as unmanly. Authorship created additional pressure for writers when dealing with social oppression because they could not hide anything from society.

My research helps promote basic research with a slightly applied finding. It affects the field of literature because it exposed the comparison between Oscar Wilde and Edith Wharton. A lot is learned from the past for a better future and a more understanding generation. When the hidden past is undug, things like how Wilde and Wharton escaped these burdens of social obligations help educate the modern world. It teaches about the change in gender roles that are happening nowadays. It proves that oppression and social pressures run through history, with no exemption for today. It is significant because it reveals the burdens, anxieties, hidden genders, and oppressions that the social obligations imply on them.

The type of graphics that was best suitable for my project was the basic grouped bar chart. In Figure 1, a visual representation of my concepts in groups and arranged bars was to show the differences in each category throughout time to compare the values between bars and divided segments. My variables were the 19th century throughout time. My subsets were authorship versus the literature theory of phenomenology, Christianity and

heteronormativity society versus queer theory, and the Aesthetic Movement versus oppressive forces. My cases were books by Oscar Wilde and Edith Wharton. The data I worked with are related to the concept of authorship, the attitudes of Christianity and heteronormativity in British society, and the behaviors of gender-fluid individuals. As time passes from one book to another, concepts such as authorship still exist in numbers even if Christian beliefs and oppressive forces decrease.

My sample is large enough to generalize the larger population because it brings light to the types of oppression and burdens that take place in modern times concerning the LGBTQ community. Even though they are no longer hiding, other types of emerging labels are not entirely expressed. It is known that discrimination and hatred are still alive within the community; therefore, the greater categories obtain full power and control. For example, there are some Latino studs dating white studs. The community does not accept two studs together, and others feel uncomfortable with this intersectionality. In acknowledging these hardships, the future for the rising LGBTQ+ authors and people look bright.

The ones who would be affected by my research would be professionals in the literature (particularly, those in the Modern British field). My sources are relevant and reliable because they were backed up by others in the same field and profession. Also, policymakers alter laws to protect students and victims of the LGBTQ community. This group of people is still struggling to be accepted and to fit in. They are obligated to fight for their rights from healthcare to working facilities because some of those people are working against them to downgrade and eliminate their desires for true happiness. Some companies do not hire you or treat you if your gay or lesbian. History is repeating itself; therefore, we are still living in a heteronormative community; it only gets better at hiding these issues by entertaining with television or games even our phones are distracting from the real world. It helps make changes for better ideas and policies for the entire community. My research impacts most Universities, students, communities, and potentially law enforcers by revealing the need for more understanding and protection. Institutions understand the queer, authorship, and literature phenomenology theories more; and how the past relates to the present. The use of the actual and fictional identities of Wilde and Wharton gives a sense of environmental influences, whether pressures from Europe or America. It is important to spread awareness and save lives. The issues that lie in traditional values and the customs ways of perceiving things must be dealt with. When people come together with the same goals, their ideas make a change in society.

### **Acknowledgements**

Special thanks to Dr. Suditi Gupta and Dr. Newton for guiding me through this step of my research, to the CSU Stanislaus Honors Program for giving me this possibility, and to my mentors Professor Wolfe from the Modern British Literature Department and Professor Davis from the English Department for this guidance and expertise in literature; as well as, the Stanislaus State Librarian, Tim held, who

suggested specific databases to search for information on my topic.

### References

- [1] Fitzsimons, E. (2015). *WILDE'S WOMEN: How Oscar Wilde Was Shaped by the Women He Knew*. New York: Duckworth Overlook.
- [2] Gagnier, R. (1991). *Critical Essays on OSCAR WILDE*. New York: G.K. Hall & Co.
- [3] Carroll, Joseph. "Aestheticism, Homoeroticism, and Christian Guilt in *The Picture of Dorian Gray*." *Twentieth-Century Literary Criticism*, edited by Kathy D. Darrow, vol. 272, Gale, 2012. *Gale Literature Resource Center*.
- [4] Gomel, Elana. "Oscar Wilde, The Picture of Dorian Gray, and the (Un)Death of the Author." *Narrative*, vol. 12, no. 1, 2004, p. 74+. *Gale Literature Resource Center*.
- [5] M. Davis. "Mind and Matter in the Picture of Dorian Gray." *Victorian Literature and Culture*. Vol. 41, 2013, pp. 547-560. *Languages and Literatures*.
- [6] Mehaffey, Marilyn Maness. "Manipulating the metaphors: 'The House of Mirth' and 'the volcanic nether-side' of 'sexuality.'." *College Literature*, vol. 21, no. 2, 1994, p. 47+. *Gale Literature Resource Center*.
- [7] Orlando, E.J. (2017). "Perilous Coquetry": Oscar Wilde's Influence on Edith Wharton and Ogden Codman, Jr. *American Literary Realism*, vol. 50(1), pp. 25-48.
- [8] Singley, Carol J. "Race, Culture, Nation: Edith Wharton and Ernest Renan." *Durham: Duke University Press*, vol. 49, 2003, pp. 32-45. *Twentieth-Century Literature*.
- [9] Tuttleton, James W. "Edith (Newbold Jones) Wharton." *American Realists and Naturalists*, edited by Donald Pizer and Earl N. Harbert, Gale, 1982. *Dictionary of Literary Biography Vol. 12. Gale Literature Resource Center*.
- [10] Von Rosk, Nancy. "Spectacular Homes and Pastoral Theaters: Gender, Urbanity and Domesticity in "The House of Mirth." *Studies in the Novel*, vol. 33, 2001, pp. 322-350. *JSTOR Arts & Sciences XI*.
- [11] WHARTON, E. D. I. T. H. (2019). *House of Mirth*. S.l.: KTOCZYTA PL.
- [12] Wilde, Oscar and Page, Norman. *The Picture of Dorian Gray*. Broadview Press, Peterborough, Ontario, 1998.

## Figures

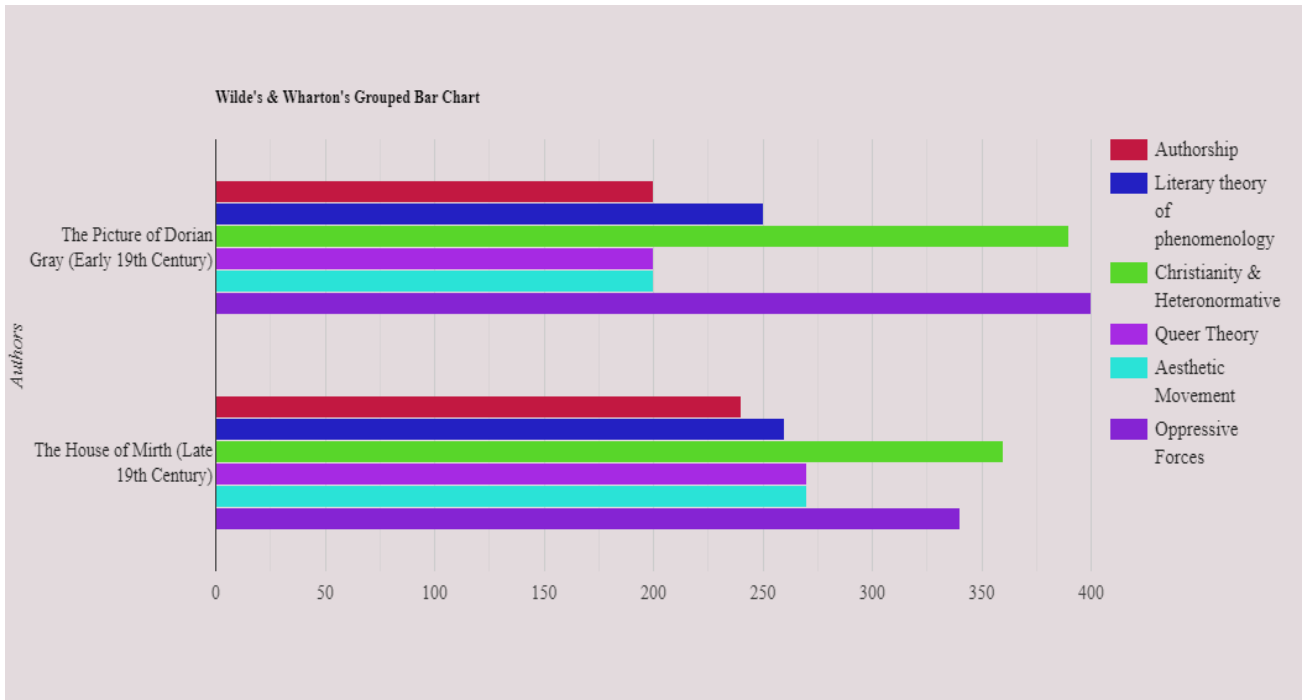


Figure 1. From authorship, the attitudes of a Christian society to the behaviors of gender-fluid people such as Queer individuals. They are grouped into two categories on the left, representing the books and their eras. Time passes from one book to another; these concepts still exist in numbers even if society decreases their Christian beliefs. The issues lie in traditional values and the customs ways of perceiving things.

# Modelling Short Gamma Ray Bursts as Structured Jets

German Astorga

*B.S. Candidate, Department of Physics, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

Received 14 May 2021; Accepted 20 July 2021

---

## Abstract

The afterglow of GW170817 has been successfully modeled as a structured, relativistic jet that is highly peaked towards the center, being viewed off-axis (e.g. Lazzati et al. 2018b<sup>1</sup>, Mooley et al. 2018<sup>3</sup>, Hajela et al. 2019<sup>4</sup>). A large sample of Swift-detected short gamma ray burst afterglows were modeled by Fong et al. (2015)<sup>2</sup> using a top-hat jet seen on-axis, with the energy and opening angle of the jet as free parameters. The objective is to find whether it is possible to adopt the structured jet from GW170817 for other short gamma ray bursts (GRBs) and to what degree. To do so we fit the same observations using a fixed (structured) jet energy distribution, and the observer angle as a free parameter. GRB 130603B was chosen to model from the Fong sample due to visible breaks in its observation. Results are in the form of fitted plots in flux versus time. Wavelength ranges were recorded in x-ray, optical, and radio. Ultimately it was determined that a structured, relativistic jet can model the afterglow of short GRBs. This is significant because the jet model for GW170817 has not been proven for all short GRBs.

*Keywords: short gamma ray bursts (GRBs), GW170817, structured jet*

---

## Introduction

### *Binary Collisions Resulting in Short GRBs*

Binary mergers occur when two massive objects collapse into each other, resulting in a violent explosion. A jet of energy forms inside the core which pushes outward through merger debris and space. The jet travels at relativistic speed while leaving a cocoon of slower material behind<sup>1</sup>. Hyper-accelerated electrons form during the beam's interaction with surrounding space. During the cooling of these electrons, electromagnetic radiation escapes outward after the jet. This is observable in what is known as the afterglow of a short gamma ray burst (SGRB). SGRBs reach the observer first followed by x-ray, optical, and radio rays. The first binary neutron star merger, GW170817, was recorded via gravity waves on 2017 August 17. LIGO and VIRGO detectors registered SGRBs directly afterwards<sup>1</sup>. This event is the basis for the structured jet model studied.

### *Gamma Ray Bursts*

Gamma Ray Bursts (GRBs) are characterized by short, intense, non-repeating flashes of high energy photons. These gamma rays carry energy in the range of an MeV and possess a wide range of spectral and temporal properties<sup>5</sup>. GRBs originate from large outbursts of energy and are among the brightest phenomenon in the world of astrophysics. GRBs can be categorized as either short or long. Long GRBs typically arise from the death of massive stars and can be detected for seconds. Short gamma ray bursts (SGRBs) originate from much more violent explosions and carry an intense pulse lasting milliseconds. It is believed that SGRBs are fathered by binary neutron star collisions or a neutron star crashing into a black hole<sup>2</sup>.

### *Afterglow Simulations*

I will be referencing the source article several times in this publication. The title will be denoted as FONG for simplicity. FONG is a compilation of SGRB studies dating from 2004 November to 2015 December. The parameters

used for its simulations were established using the standard afterglow synchrotron model and observing trends amongst events. Observations for GW170817 occurred during and after 2017 August. Therefore, it is important to highlight FONG's parameters for these values and how they compare to those fitted in this experiment.

The afterglow that follows a jet is evolved from the energy structure of the jet and the circumburst density it interacts with. The kinetic energy of a jet fluctuates in real time and is difficult to infer due to varying opening angles. To estimate this, FONG, infers the isotropic-equivalent kinetic energy (IEKE) by assuming the burst is equal in all measurable directions. The IEKE is individually calculated for each significant burst using correction factors for a range of isotropic-equivalent gamma ray energies (IEGRE). IEGRE is the estimated energy of gamma rays. The value is used to compare IEKE to valid results. The IEKE was found to be in range of approximately  $(0.04-45) \times 10^{51}$  with a medium value of  $1.8 \times 10^{51}$ . The circumburst density ( $c$ -density) is the approximate rate of mass in space surrounding a jet. FONG uses the standard synchrotron model to find the constant density medium of a relativistic blast wave. The standard synchrotron model is essentially a relativistic blast wave expanding into an external medium<sup>6</sup>. The blast wave amplifies the magnetic field in the area and accelerates electrons into a power-law distribution. The electrons are then cooled adiabatically and through emission of synchrotron and inverse compton radiation<sup>6</sup>. The spectra of afterglow are then determined by this effect. FONG uses the product of spectra for each SGRB to approximate the original  $c$ -densities from blasts. The median  $c$ -density was found to be  $2.9 \times 10^{-3} \text{ [cm]}^{-3}$ .

Once the afterglow begins to radiate, observation from Earth is then affected by jet opening angles. Viewing an afterglow off-axis as opposed to on-axis results in a weaker, elongated observation. The direction of a relativistic beam has direct influence over an afterglow's intensity and time observed<sup>7</sup>. Often an off-axis beam will produce jet

breaks noticeable in satellite recordings. FONG calculates the opening jet angle by factoring in time of jet break, energy, density, and redshift into an equation referenced from the ScaleFit model. The ScaleFit model is traced back to GAMMA-RAY BURSTS ARE OBSERVED OFF AXIS<sup>7</sup>. It uses scaling relations in hydrodynamic and radiation equations to produce a simulated light curve. For our purposes there is no need to go into detail on the model since our program produces angles as a free parameter.

### Structured Jet Modelling and Parameters

In FONG, the afterglow simulation relies on a fixed angle and a top hat energy distribution. This differs from the GW170817 simulation because the program uses a structured, relativistic jet with different fitting parameters. By applying the new model to GRB130603B, we are able to fit an observer angle relative to the jet, the fraction of shock energy to electron energy ( $\epsilon_e$ ), and the fraction of shock energy to magnetic field energy ( $\epsilon_b$ ). These are all fixed values in FONG's simulation and are a result of having varying energy distributions over angle and time. The circumburst density ( $n_{\text{ISM}}$ ), electronic index ( $P_{\text{index}}$ ), ETA, isotropic-equivalent kinetic energy ( $E_{k,\text{ISO}}$ ), and isotropic-equivalent gamma ray energies ( $E_{\gamma,\text{ISO}}$ ), are fitted in both simulations. These values can be found on Tables 1 and 2.

## Methods

### Acquire Observations

The first step was to download all the data files from FONG and decide what was essential. There was a total of 8 tables that were downloaded with data pertaining to each significant short gamma ray burst. Parameters were extracted from the x-ray, optical, radio and redshift files. After analyzing each burst, GRB130603B was chosen because it contains noticeable breaks in the x-ray and optical spectrum. This will make the fitting process difficult by adding complexity to the curve fit we want. By selecting a GRB130603B, we are setting precedent to fit simpler short GRBs with linear curves for the future.

### Afterglow Modelling

The coding language the program is written in is python. I will be referring to specific sections of the code as boxes. First, the program loads several required data files from box 2 and loads the observations of 130603B from box 5. The required data files are models for the fitting procedure. We started with a total of 90 models. Then gaussian process regression (GPR) was used twice. It first (box 6) uses it on each model to obtain the flux at the times and frequencies of the observations. Then (box 7) it uses GPR again, using the known parameters of the models, to make a procedure that will find an interpolated value for those fluxes and any set of parameters ( $\epsilon_e$ ,  $\epsilon_b$ ,  $P_{\text{index}}$ ,  $n_{\text{ISM}}$ , and observer angle). Once it has that, it then finds a best fit set of parameters. First, using a regular fitting procedure, and then later using MCMC (Markov-chain Monte Carlo). Then by hand, that best fit is used to iterate and find a better fit. For example, the file `run_code_test_fit_130603B_14.py` contains the parameters for the 14th iteration, and is run by the file `make_datafile_example.ipynb` to make a new data file. Then in the main code (box 11), it loads that data file

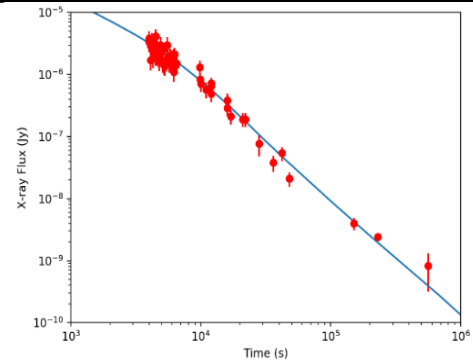
and compares it to the previous fit with the same parameters. To improve the fit, we then go back to box 2, add the new file and parameters to the ones used for fitting, and run everything again. After repeating the process 14 times, it was able to produce reasonable results.

## Results

### Analysis of Afterglow Simulations

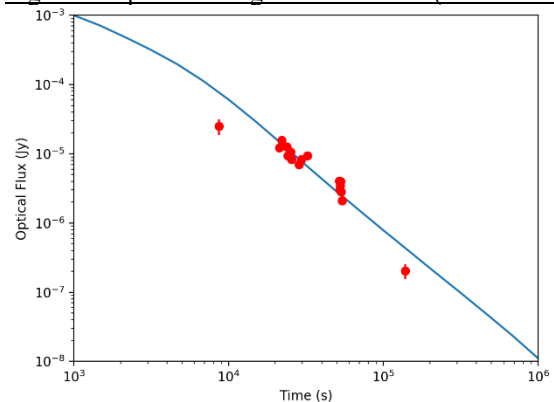
The results are in the form of 2D plots displaying flux versus time. Three plots were produced for wavelengths in x-ray, optical, and radio. The goal was to replicate the breaks over time for each spectrum.

Figure 1. X-ray Afterglow Simulation (Flux vs Time)



Through the observation points, the x-ray data set has a visible break at  $10^4$  seconds. As a preliminary fit, the simulation successfully replicates this break, shown in Figure 1. The light curve breaks off at around  $10^{-6}$  Jy which is the appropriate flux for this time. Such a good fit can be attributed to the large number of data points before and after the break. This proves that the structured jet model can be applied to other short GRBs and be met with success.

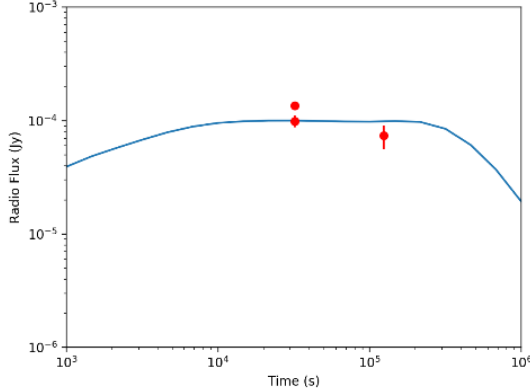
Figure 2. Optical Afterglow Simulation (Flux vs Time)



The optical data set is observed to have 2 breaks at  $10^4$  seconds and after  $10^5$  seconds. In Figure 2, the break at  $10^4$  seconds is replicated but does so too early at  $10^{-4}$  Jy. The second break fails to form at all for  $10^5$  seconds. We theorize that the reason the optical spectrum was not as successful as the X-ray, is due to having less data points for the afterglow code to use during the fitting process. Further iterations of the program can be ran to create the complex light curve.



Figure 3. Radio Afterglow Simulation (Flux vs Time)



The radio data set does not have sufficient data points to observe a break. This is expected to result in a linear light curve. However, this is not the case. Figure 3 shows the radio simulation as having an upside-down parabola shape. The curve does not even lie within range of the observation error bars. This can be directly attributed to lack of data for this range of wavelengths. With several more iterations of the program, it is likely possible to fit a linear curve.

#### Analysis of Parameters

There were discrepancies between the parameters used in FONG’s simulation and ours. The results for the fitting routine are displayed on Table 1. The values that stand out are those for ISM density ( $n_{ISM}$ ) and electronic index ( $P_{index}$ ). Compared to the values from FONG on Table 2, the ISM density saw an increase of ~1224% (112 vs 0.09). A harder electronic index was also fitted of 2.3 versus 2.7. This is believed to be a direct result of the structured model used. The transition from a fixed energy amount to a gaussian curve requires different assumptions for different jets. To make the jet bright enough, and compensate for an early break, a higher ISM density is needed. This could be why the x-ray break was replicated so well, but as a result it influenced a higher break in the optical simulation. The fixed energy for the fitted observer angle of  $2.75^\circ$  is 0.8 J. Epsilon e was nearly the same for both models.

| Parameter           | Value                          |
|---------------------|--------------------------------|
| $n_{ISM}$           | $112 \pm 17$                   |
| Observer Angle      | $2.75 - 0.13 + 0.11$           |
| $P_{index}$         | $2.336 - 0.020 + 0.019$        |
| $\epsilon_{\beta}$  | $1.29e-4 - 1.3e-5 + 2.6e-5$    |
| $\epsilon_e$        | $0.089 - 0.014 + 0.008$        |
| Opening Angle       | Structured Jet from Simulation |
| $E_{k,iso,52}$      | 0.80 (at 2.75 degrees)         |
| $E_{\gamma,iso,52}$ | 37                             |
| ETA                 | 0.32                           |

TABLE I. Experimental Parameters from Simulation

| Parameter           | Value                |
|---------------------|----------------------|
| $n_{ISM}$           | $0.09 + 0.04 - 0.03$ |
| Observer Angle      | 0 (Fixed)            |
| $P_{index}$         | $2.7 \pm 0.06$       |
| $\epsilon_{\beta}$  | 0.1 (Fixed)          |
| $\epsilon_e$        | 0.1 (Fixed)          |
| Opening Angle       | $6 \pm 2$            |
| $E_{k,iso,52}$      | $0.11 \pm 0.02$      |
| $E_{\gamma,iso,52}$ | 0.37                 |
| ETA                 | 0.77                 |

TABLE II. Parameters from Fong et al. 2015

#### Conclusion

We produce a reasonable fit to GRB130603B using a simulated short GRB jet viewed a few degrees off axis. Compared to the fit for an on-axis top-hat jet of FONG, we find a ~1000 times higher ISM density (110 vs 0.09), and a harder electron index (2.34 vs. 2.7). This is thought to be a method of compensation in the code, to accommodate flux levels for this particular jet. Our fit manages to reproduce the break in the X-ray light curve at about  $10^4$  seconds. However, it does not reproduce the two breaks in the optical light curve nor the predicted linear curve for the radio.

For the future we plan to automate fitting process to remove procedures done by hand. This will expedite the amount of time it takes to run each iteration. With each iteration, the resulting light curves are created using more coherent parameters. The next plan is to apply the structured jet model to another short gamma ray burst using the parameters obtained in this run.

#### Acknowledgements

I would like to thank my research advisor Dr. Brian Morsony for supervising the project, my Cal-Bridge mentor Dr. Susan Mokhtari, and the person who encouraged me start research, Dr. Wing To. I would also like to thank the McNair Scholars Program, Cal-Bridge, and LSAMP for their support.

#### References

- [1] Lazzati D., Perna R., Morsony B., Lopez-Camara D., Cantiello M., Ciolfi R., Giacomazzo B., Workman J. C. (11 May 2018). Late time afterglow observations reveal a collimated relativistic jet in the ejecta of the binary neutron star merger GW170817. Physical Review, v. 120, iss. 24, doi: <https://doi.org/10.1103/PhysRevLett.120.241103>
- [2] Fong, W., Berger E., Margutti R., Zauderer B. A. (2015 December 20). A DECADE OF SHORT-DURATION GAMMA-RAY BURST BROADBAND AFTERGLOWS: ENERGETICS, CIRCUMBURST DENSITIES, AND JET OPENING ANGLES. The Astrophysical Journal, v.815, n. 2, doi:10.1088/0004-637X/815/2/102
- [3] Mooley, K., Nakar, E., Hotokezaka, K., Hallinan, G., Corsi, A., Frail, D., Horesh, A., Murphy, T., Lenc, E., Kaplan, D., De, K., Dobie, D., Chandra, P.,

- Deller, A., Gottlieb, O., Kasliwal, M., Kulkarni, S., Myers, S., Nissanke, S., Piran, T., Lynch, C., Bhalerao, V., Bourke, S., Bannister, K. and Singer, L., 2017. A mildly relativistic wide-angle outflow in the neutron-star merger event GW170817. *Nature*, 554(7691), pp.207-210.
- [4] Hajela, A., Margutti, R., Alexander, K., Kathirgamaraju, A., Baldeschi, A., & Guidorzi, C. et al. (2019). Two Years of Nonthermal Emission from the Binary Neutron Star Merger GW170817: Rapid Fading of the Jet Afterglow and First Constraints on the Kilonova Fastest Ejecta. *The Astrophysical Journal*, 886(1), L17. doi: 10.3847/2041-8213/ab5226
- [5] Berger, E. (2013 November 11). Short-Duration Gamma-Ray Bursts. *2014 Annual Review of Astronomy and Astrophysics*, v. 52, p.43-105, doi:10.1146/annurev-astro-081913-035926
- [6] Granot, J., & Sari, R. (2002). The Shape of Spectral Breaks in Gamma-Ray Burst Afterglows. *The Astrophysical Journal*, 568(2), 820-829. doi: 10.1086/338966
- [7] Ryan, G., van Eerten, H., MacFadyen, A., & Zhang, B. (2015). GAMMA-RAY BURSTS ARE OBSERVED OFF-AXIS. *The Astrophysical Journal*, 799(1), 3. doi: 10.1088/0004-637x/799/1/3

# Racialization: How Does It Affect Latinx Immigrant Students?

Aurora Ceja

*B.A. Candidate, Department of Sociology, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

Received 16 April 2021; accepted 20 July 2021

---

## Abstract

Universities have pushed to become diverse and inclusive; it is important to know how students are being treated in the educational spaces. This project is based on students' experiences of racialization, and how it will affect their feelings of belonging in educational institutions. A campus cannot become diverse if students of color feel neglected and discriminated against, especially in Hispanic Serving Institutions (HSI) like CSU Stanislaus. For my expected results, I anticipate that students have had experiences with racialization, which turn into shame or insecurity on being a university student. Which will then provide evidence that my two hypotheses are correct. The responses will hopefully lead to more exposure on the treatment of students at the CSU Stanislaus campus.

---

## Introduction

Living in the US for people of color can be challenging. People of color may face obstacles and challenges due to policies and laws set against them. Being a student of color who is also an immigrant only increases those challenges. For those reasons I have chosen two hypotheses for my research project: 1) Latinx students who experience fewer microaggressions will feel safer and 2) Latinx students who have experienced more microaggressions will feel that their concerns on racism will not be taken seriously. "People of color must navigate important spaces and institutions, including educational settings, that are often white controlled" (Ballinas, 2017). Individuals with features such as different hair texture, eye shape, nose shape, skin color and darker eye color. Typically, students who have these characteristics are targeted for microaggressions and racialization. Microaggressions are statements or actions that are subtle discriminations towards a person. "Naming and challenging them is also extremely difficult because the person suffering the microaggression may not realize it in the moment or may withdraw confused about the awkward interaction" (Espitia, 2016). Microaggressions can be difficult to recognize. Some examples are a bit more obvious such as "You are so articulate", "What are you?" and "All Lives Matter". Students can face these types of questions from time to time. Racialization occurs when a race or ethnicity is assigned to a person, usually due to their physical appearance.

Immigrant Latino students who happen to be undocumented will have an additional

hindrance. Their legal status is a cause of marginalization. These students are not able to have the same opportunities as students who are citizens of the US. Not only will their legal status hold them back, but their ethnicity could be used against them. "Consistent with this, many surveys show that there is generally less support for immigration from those who look different from a majority of White Americans, that is, those with darker skin and less European features" (Ostfeld, 2017). No matter if they have been raised here in the US, immigrant Latinx students will have "ambiguous belonging" (Bjorklund, 2018). They are in a state of belonging and not belonging because they are not fully integrated into society. The immigrant students have been kept on the fringes for a long time. "Students expressed feelings of intense shock, fear, stigma, grief, anxiety, shame, embarrassment, confusion, stress, depression, confusion, and frustration on learning about their status" (Bjorklund, 2018). Those feelings of helplessness stem from the fear of their status being explained to them. There are examples of undocumented immigrant students learning of their status. Their options are severely limited compared to students who are citizens. Their fear of being exposed can affect their social relationships as well. The relationships with their peers, friends and professors could be limited. "Fears of being outed frequently limit interactions with teachers and peers, leading to lower motivation for pursuing higher education" (Bjorklund, 2018). Continuous interactions with people might have people feeling paranoid or anxious due to keeping their statuses a secret.

Immigrant students may not know who they can trust.

It can become complicated for a Latinx student to be in a University where there are not many people that look like them. “The whiteness of these spaces is a consequence of their histories, structures, practices, and discourses that reproduce racial inequalities as well as the assumed superiority of whites and assumed inferiority of people of color” (Ballinas, 2017). Universities and even high schools can be predominantly white. It is in these institutions that Latinx students may be wary of attending or continuing their education. Not only have Latinx immigrant students are worried about the cost of attending Universities. Immigrant students may not fulfill their full potential because of the cost of schooling. Undocumented students are not able to use the same resources that citizens can. “Ineligibility for federal and state financial aid programs creates yet another barrier for undocumented Latina/o students pursuing higher education” (Huber and Magalon, 2007). It is another burden that Latinx undocumented students must bear due to their status. Students may feel inferior or excluded due to the reactions from their white peers. “Some other students felt unwelcomed through the many ‘stares’ and ‘weird looks’ they received from white students on campus and in the town when they were together with other Mexican students” (Ballinas, 2017). Latinx students live in a society that racializes and stigmatizes them. This experience from Latinx is one that is not uncommon for students of color. “This process of dividing people into dehumanizing categories seems ever present” (Espitia, 2016).

## Methods

My research project was survey based and targeted Latinx immigrant students from CSU Stanislaus. In order to find my respondents, students were recruited through the Dreamers Project coordinator, a personal contact and through my professors. An online survey of 28 questions including demographic questions were sent to the respondents who fit the criteria. Due to the limitations of the criteria, the sample size was relatively small with only 28 respondents. The online survey was sent out to CSU Stanislaus students between the ages of 18-40 years old. The survey was kept completely anonymous since some of my respondents are part of the Dreamers program. The survey questions will refer to two different types of racialization a student may face: in general, and within an educational

institution. The survey was filled with close-ended questions, the three demographic questions were the only ones that were open-ended.

## Results

As mentioned before the survey taken by respondents was 28 questions long. The questions range from questions on their general experiences being racialized to questions within an Educational system. The following questions that I have used were questions that fulfilled my two hypotheses. My independent variables were questions about their experiences with microaggressions. My two dependent variables were their feelings of safety and whether they would have been taken seriously. The first two questions are about experiences students could have faced on a day-to-day basis on Figure 1. Question 4 asks whether students have been called a racial slur, of which 71.4% of respondents said yes, students have been called a racial slur. Question 6 asks respondents about a certain microaggression that can be common, 67.9% of respondents said yes, students have faced this exact microaggression.

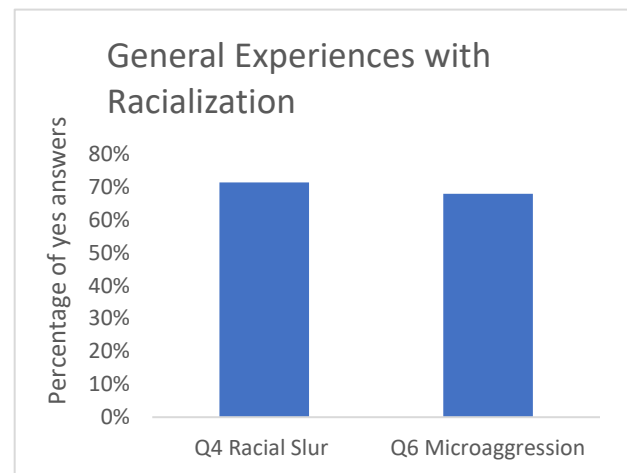


Figure 1- Question 4: Have you ever experienced a racial slur? Question 6: Have you ever been asked 'what are you'?

The following 2 questions cover experiences that could have occurred on campus. Question 9 asks students if faculty have made assumptions on their race, 71.4% of respondents said yes, faculty have assumed the race of their students. Question 10 asks students if they were enrolled into an English learner program without needing to be, 64.3% of respondents said yes,

students were put into ESL programs without needing the classes. This is a very specific question included in the survey because of a personal experience. As a Latina student, I was automatically enrolled into an ESL program regardless of my proficient English. Latinx students are being racialized and deal with microaggressions in a space that should be safe. Students should be supported in the educational institutions where they are present daily.

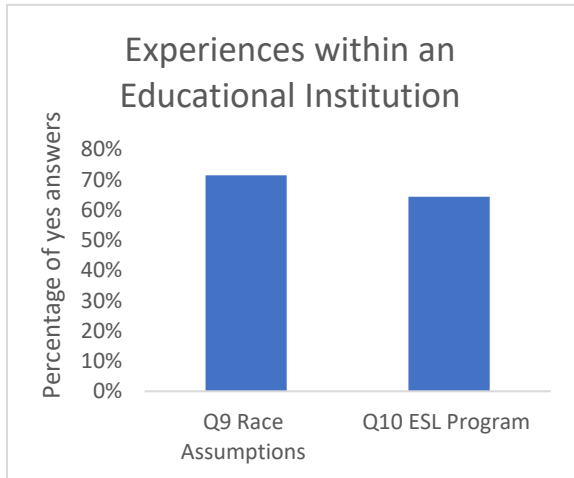


Figure 2- Question 9: Has a student or faculty member ever made assumptions about your race? Question 10: As a student were you automatically put into an English learner program (such as ESL) even though you were already an English speaker?

The following two questions, on Figures 3a and 3b, have been included together due to the similarity of the questions. Both questions 20 & 21 will ask respondents the same premise, but within different timeframes and education institutions. Question 20 questions students about racism or racial inequality concerns and whether they were taken seriously. In their younger years, 46.4% students felt that they could not speak about their concerns. Question 21 covers their concerns within their current education institution. 75% strongly agreed that they could speak about their concerns on campus, but more could always be done to help immigrant students.

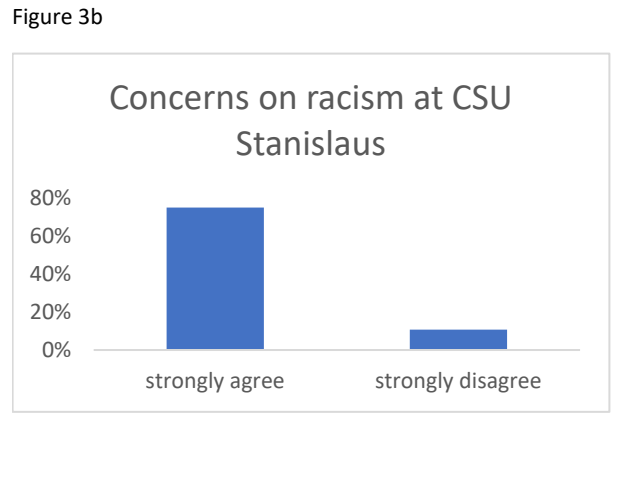
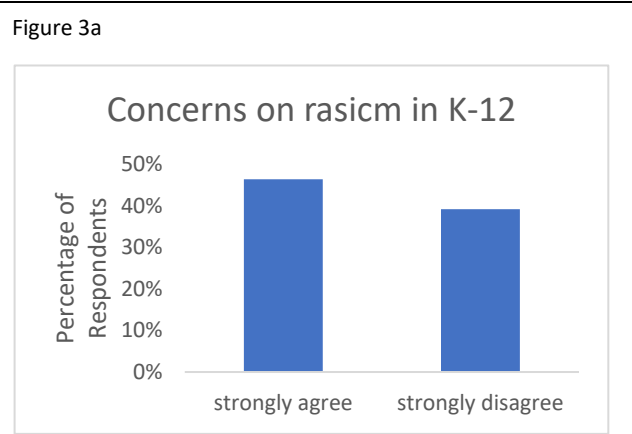


Figure 3a- Question 20: I feel that concerns about racism or racial inequality were or would have been taken seriously by teachers/administrators in my elementary, middle, or high school. Figure 3b- Question 21: I feel that concerns about racism or racial inequality will be taken seriously by faculty/administrators in my current educational institution.

The following two questions have been included together on Figures 4a & 4b, have also been put together because it asks respondents how they feel about their safety and care on campus. Question 24 asks respondents whether they feel safe being at the CSU Stanislaus campus. 75% of students strongly agreed that they felt safe being on campus. Question 25 is based on their feelings of the policies CSU Stanislaus has against student discrimination. 64.4% of students strongly agreed that there are adequate policies against student discrimination.

Figure 4a \*.89

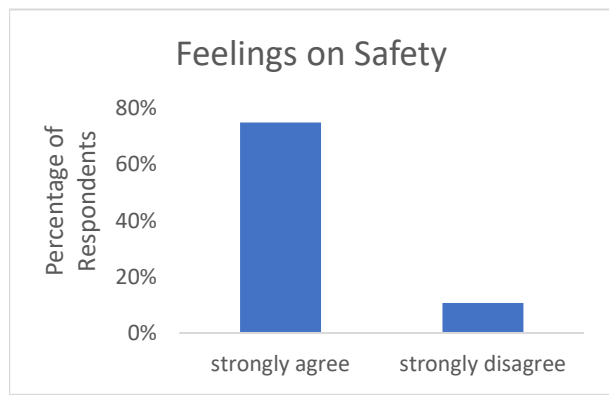


Figure 4b \*\*.66

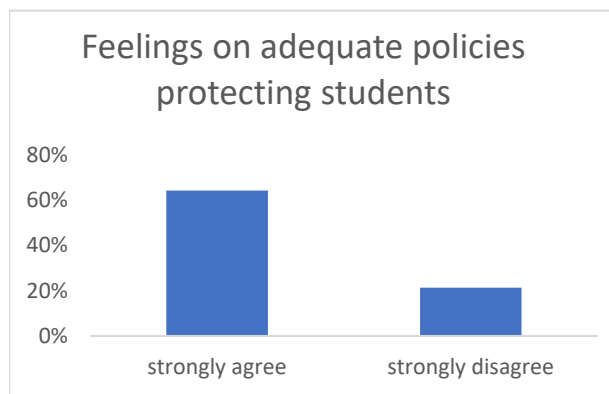


Figure 4a- Question 24: I generally feel safe when I am on campus. Figure 4b- Question 25: I feel that there are adequate policies on campus to help protect me from discrimination or racial violence. \*p-value = .89 \*\* p-value = .66

Lastly, I have included the results of comparing students' experiences to microaggressions and their feelings of being on campus. My two hypotheses were split between my independent variables and my dependent variables. My first 4 questions were my independent variables that measured the microaggressions students may have faced. My dependent variables were their feelings of safety and their feelings on being taken seriously. For my results, I have a composite score from the responses of the students who have faced microaggressions before. I have compared that to Q24 and Q25. Q24 asks students about their feelings of safety which gave a gamma score of .211 (p value = .89) which means that there is a correlation between students who have faced microaggressions and their feelings of safety on campus. The next result was from Q25 which asked students about their feelings about policies protecting students against discrimination. Q25

had a gamma score of .489 (p value = .66) which means that there is a high correlation between students who have faced microaggressions and their feelings of being protect by the policies on campus.

## Discussion

Latinx students are being racialized within educational institutions. From the previous data shown, students have faced discrimination within K-12 schools. Within CSU Stanislaus, an HSI, students feel more comfortable. 56.7% of the student body identify as Hispanic/Latino attending CSU Stanislaus, but there could be a difference for students who do not attend a University with high percentage of Latinx students (CSU Stanislaus, 2020). From the previous graphs shown, Latinx students have faced some difficult situations that cause them to feel ashamed and voiceless. Their educational experiences from their student careers will carry on into the future. Their social relationships will be affected as well as their motivation to continue onto higher education. Changes should be made for Latinx immigrant students to fulfill their full potential. "Student organizations, diversity/multicultural offices, undocumented student centers, and the like can help students create supportive networks and contribute to their success and persistence" (Bjorklund, 2018). All types of Latinx students, who do not identify as immigrant students, need to have support systems in place to provide the aid they need. Additional recommendations by Huber and Magalon include implementing better transfer culture, providing resources, guidance, and preparation to transition to a university, outreach for parents' support and having college materials in both Spanish and English (2007). Implementing these recommendations can be incredibly beneficial to Latinx students and can better their completion of their education.

## Acknowledgements

This project would not have been possible without the California State University, Stanislaus McNair Scholars program and Honors programs. Thank you for all the support and feedback during this research project Dr. Ellen Bell and Dr. Jamila Newton. I would like to express my gratitude to my mentor, Dr. Jennifer Strangfeld for her guidance and knowledge. I am thankful for my professors, Dr. Mary Roaf, Dr. Cueponcaxochitl Moreno Sandoval, Dr. Seng Vang and to Polet Hernandez Perez for their support and aid.

## References

- Ballinas, J. (2017). Where are you from and why are you here? microaggressions, racialization, and mexican college students in a new destination. *Sociological Inquiry*, <https://doi.org/10.1111/soin.12181>
- Bjorklund Jr, P. (2018). Undocumented students in higher education: A review of the literature, 2001 to 2016. *Review of Educational Research*.
- Espitia, B. B. (2016). Micro-aggressions and their violent impact on low income latinos in the us. *Hispanófila*,
- Perez Huber, L. & Magalon, M. C. (2007). Silenced struggles: The experience of latina and latino undocumented college students in california. *Nevada Law Journal*. Vol, 7(3) <https://scholars.law.unlv.edu/nlj/vol7/iss3/8>
- Stanislaus State. (2020). Institutional data: Quick facts. <https://www.csustan.edu/iea/institutional-data/quick-facts>
- Ostfeld, M. (2017). The backyard politics of attitudes toward immigration. *Political Psychology*,

# Will the Electrodynamic Screen Cleaning Method be Effective in Stanislaus County?

Ryan De Los Santos

*B.S. Candidate, Department of Physics, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

Received 16 April 2021; accepted 20 July 2021

---

## Abstract

Solar energy is today's leading contender for renewable energy. However, one of the hurdles that needs to be addressed is the dirtying that these solar panels can face. Over months of operation, photovoltaic cells can lose large percentages of their efficiency due to the accumulation of dust and other contaminants that layer the surface of the cell. In this paper the electrodynamic screen cleaning method is simulated on a standard sized (5.4' x 3.25') residential solar panel using a python code to determine how effective this cleaning method would be in Stanislaus County, an urban area with a Mediterranean climate. Solar radiance data along with daily rainfall data is used to characterize the area. The simulations found that the electrodynamic screen would keep the solar panel at near 100% of the panel's clean efficiency and in total the electrodynamic screen allowed the panel to produce 216 kWh more than the uncleaned panel.

*Keywords: Solar Panel, Electrodynamic Screen, Solar Panel Dirtying*

---

## Introduction

Solar panel energy has seen a rise in popularity in the past decade. The seemingly unlimited amount of energy that can be recovered from solar panels, along with the minimal carbon footprint that they leave behind, has made photovoltaic cells a preferable source of energy. According to an article published by the NSF (2017), prices for commercial use of solar panels have become competitive with coal generated power at a cost of \$0.07/kWh. However, the price of residential use remains at a cost of \$0.18/kWh. The high cost of solar power energy in residential areas is the main factor in the slow upcoming of solar energy. This problem is worsened by the fact that solar panels continually degrade in efficiency. A major source for this degradation is the accumulation of dust on the solar panel throughout its lifetime. In urban settings this can account for a loss in efficiency of 0.14% per day (Boyle et al., 2015). Due to this large loss of efficiency, research is currently being done to determine the most cost-effective way to remove dust from these solar panels.

One way in which dust can be removed from these panels is through rainfall. This process is harmless and is free, therefore, it would be the optimal solution. Alongside this, according to Kimber et al. (2006), when analyzing the energy production of solar farms, rain cleans solar panels to nearly optimal efficiencies. However, in much drier regions, rainfall is not a reliable cleaning method. While the same effect could be attained by spraying the panels with water, the scarcity of water in some regions makes this solution undesirable. It is in these regions where the electrodynamic screen is shown to be most effective. The electrodynamic screen is a self-contained cleaning method which sends an alternating current across a solar panel to repel charged dust particles off the surface of the panel (Mazumder et al., 2007). These charged particles are then able to collide with and push off uncharged dust particles, effectively cleaning

the panel's surface.

Due to the effectiveness of rainfall alone, this interplay between the cleaning of the solar panel through rainfall and the cleaning through the EDS is important when analyzing whether an EDS will produce significant increases in energy output. This paper analyzes the effect that the EDS can have on solar energy production of a solar panel in the Mediterranean climate of Stanislaus County.

## Methods

This solar panel research paper relied on a simulation created in python to simulate the dirtying and cleaning of the solar panel. To perform this analysis, three pieces of weather data were used to characterize the conditions of Stanislaus County: precipitation, solar radiance, and the dust accumulation rate. For precipitation, data gathered in 2019 by the NOAA foundation was used. For solar radiation, bihourly data was obtained from the National Solar Radiation Database. For the dust accumulation rate, due to the lack of local experimentation, data gathered by Boyle et al. (2015) in an urban setting in Colorado was used. The resolution of these data sets does not align, however. The solar radiation data was taken at thirty-minute intervals while the rainfall data was taken daily. Therefore, to manage this discontinuity, for every day that was ran through the simulation, the maximum solar radiation for that day was used.

The simulated solar panel had dimensions of 5.4 feet by 3.25 feet. A linear degradation method was used to simulate the dirtying of the solar panel, meaning a set percentage of the solar panel's efficiency was lost every day of the simulation. The formula for the efficiency and the optimal cycle for the EDS was obtained from Qian, Marshall, and Frolik (2011). The function that determines the efficiency of the solar panel with an EDS is given by:



$$\eta = \frac{1}{2} (1 + V'_{on}) - \left( \frac{A_{particle}}{A_{panel}} \right) \left( \frac{n_d}{f} \right) \left( \frac{P_{curtain}}{P_{clean}} \right) \left( \frac{c_x}{\lambda} \right) (1 - V'_{on})^{-1}$$

The value for  $V'_{on}$  was determined by cycling through a large range of voltages and determining which voltage produced the highest efficiency. The wavelength, frequency, and the power of the curtain were obtained in the research paper by Qian et al. (2011). The dust settling rate  $n_d$  was calculated using the data gathered by Boyle et al. (2015), and the power of the clean solar panel was calculated using the solar radiation data from the National Solar Radiation Database.

Alongside the EDS, precipitation was used as an external source of cleaning for the solar panel. If the weather data states that it rained on a given day, then both the solar panel with the EDS and the bare solar panel were cleaned and returned to its maximum efficiency. Analyzing the data was done by comparing the power output of the solar panel with the electrodynamic screen and the uncleaned solar panel after one simulated year of operation.

## Results

The first scenario that was simulated with my python code was that of a solar panel with no cleaning method attached. The dust was assumed to fall at a constant rate such that it lost 0.14% of its efficiency per day. The only way that this dust was cleaned from the solar panel was through rainfall, in which case the solar panel would be returned to the maximum efficiency.

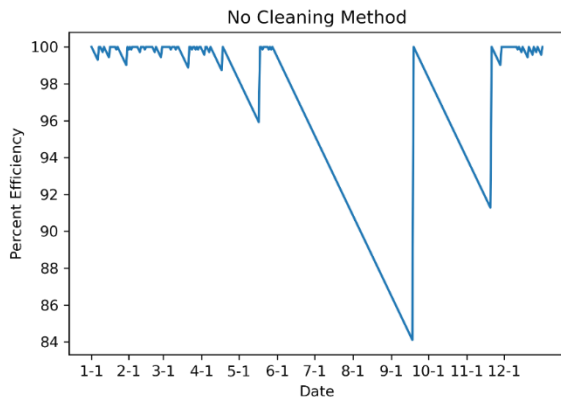


Figure 1

As can be seen in figure 1, this setup for the simulation results in near optimal efficiency until May. The duration between rainfall during these times is minimal, so the solar panel is cleaned naturally, and no outside cleaning methods are needed. However, starting in May and not ending until December, the graph takes on a different trend. We begin to see large drops in efficiency during these periods. These drops occur due to the lack of rainfall during these times in the year. The biggest drop in efficiency was a 16% drop in efficiency in July. Another large drop occurred directly after this as well, leading to an efficiency of 90% due to dust alone.

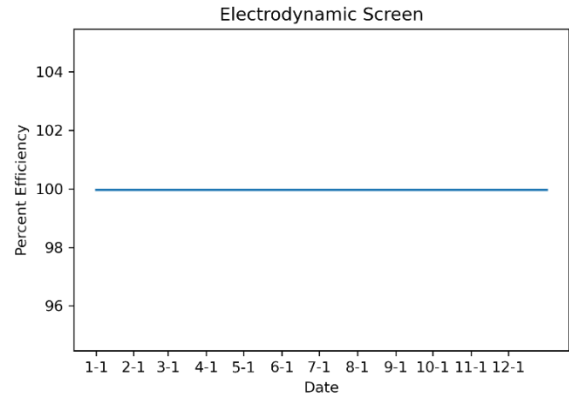


Figure 2

The simulation was then used to determine how efficient a solar panel would be throughout the year if the EDS were attached to it. The EDS was run on an optimal cycle so that it would turn on when the efficiency dropped to 99.98%, the EDS would then stay on until the solar panel was fully cleaned. Due to the simulations being limited to a resolution of one day, this meant that solar panel is shown to remain at 100% efficiency all throughout the year. These results can be seen in figure 2.

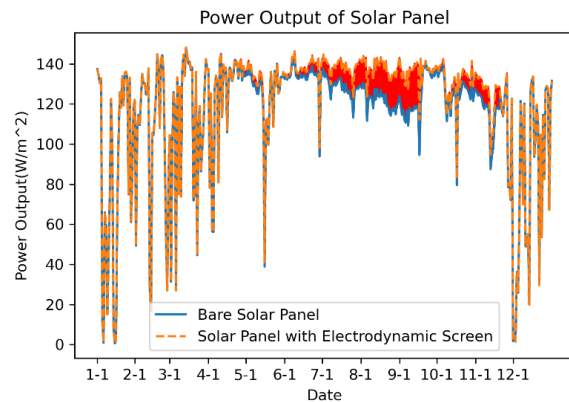


Figure 3

However, the real use of solar panels is not based off their efficiency, it is based off their power production. Since the solar energy available throughout the year varies, I also had to account for this. Inside the code, the sunlight was assumed to hit the solar panel perpendicularly throughout the day and the greatest solar power for a given day was used to simulate the solar panel for that day. These constraints were due to the lack of more precise rainfall data. The power outputs of the two solar panels were graphed and compared as shown in figure 3. There are two main regions that are prevalent in the graph, the wet season and the dry season. During the wet season, the power output of the two solar panels were identical. There were no differences in power output, as represented by the red shaded regions from January to May. In the month of May we begin to see the first signs of a differing power output caused by the increase in duration between rainfalls. The second region that is prevalent in this graph is the dry season, which lasts from about June to November as shown on the graph. During these months, as was shown in Figure 1, the efficiency of the uncleaned solar panel dropped drastically, while Figure

2 showed the solar panel with an EDS remained at 100% efficiency. This drop in efficiency carried over to the power output of the solar panel. During these months on the graph in Figure 3, we begin to see large regions of red appear, indicating a sizable difference in power output between the two panels. Throughout the whole year, the total energy difference between the two solar panels was 216 kWh. Using the energy price currently in Stanislaus County in 2021, that amounts to an annual savings of \$43.25 due to the increased power production of the solar panel with an EDS.

### Future work

In this simulation, there are areas that can be improved upon to provide a better representation of the real scenario. There are multiple assumptions that were made that could have had a significant impact on the results of this experiment. The first assumption that was made, was that the EDS and rainfall fully clean the solar panel. This is often not the case, and the EDS is usually kept running until the solar panel reaches a certain percentage of the optimal efficiency. A more complex code and dust analysis is required in order to effectively model this type of cycle. Secondly, there are multiple parameters that characterize the cycle of the EDS. These parameters include the dust particle size, the dust accumulation rate, and the specific configuration of the EDS itself. Since this type of research is not prevalent in Stanislaus County, these parameters were obtained by looking at those parameters in experiments with locations that I deemed similar in climate to Stanislaus County. There are other aspects that may have affected my simulation, such as wind and humidity, however, the error associated with these aspects would have been insignificant compared to the other two assumptions.

When analyzing the effects that my assumptions could have had on the output of the experiment, it is my belief that these assumptions made it so that the results of my simulations were overestimates. If one were to improve the accuracy of this code and implement the corrections mentioned above, the simulations would likely show that the EDS saves less than 216 kWh. While the simulation could be improved, due to the many parameters that characterize the simulation, the most effective form of research in this field would be a physical research experiment.

### Acknowledgements

I would like to thank Dr. Brian Morsony and Dr. Liangmin Zhang of the physics department at Stanislaus State for providing me with the information that has allowed me to complete this research project.

### References

- [1] Boyle, L., Flinchpaugh, H., & Hannigan, M. P. (2015). Natural soiling of photovoltaic cover plates and the impact on transmission. *Renewable Energy*, 77, 166-173.
- [2] Kimber, A., Mitchell, L., Nogradi, S., & Wenger, H. (2006, May). The effect of soiling on large grid-

connected photovoltaic systems in California and the southwest region of the United States. In 2006 IEEE 4th World Conference on Photovoltaic Energy Conference (Vol. 2, pp. 2391-2395). IEEE.

- [3] Mazumder, M. K., Sharma, R., Biris, A. S., Zhang, J., Calle, C., & Zahn, M. (2007). Self-cleaning transparent dust shields for protecting solar panels and other devices. *Particulate Science and Technology*, 25(1), 5-20.
- [4] NOAA. (2021). Daily Summaries [Data File]. Retrieved from <https://www.ncdc.noaa.gov/cdo-web/search?datasetid=GHCND>
- [5] NREL. (2021). NSRBD [Data File]. Retrieved from <https://nsrdb.nrel.gov/>
- [6] Qian, D., Marshall, J., & Frolik, J. (2011). "Control analysis for solar panel dust mitigation using an electric curtain" *Elsevier*. [www.elsevier.com/locate/rser](http://www.elsevier.com/locate/rser).

# The Impact of Trauma Informed Education Practices on Combatting Inequity in Schools

Megan Dean

*B.A. Candidate, Department of English, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

Received 14 May 2021; accepted 20 July 2021

---

## Abstract

This project focuses on the impact of trauma informed education practices on combatting inequity in schools. It answers three questions of what are trauma informed practices, how they combat inequity in schools, and how they can be applied in classrooms. A definition for these practices was concluded as practices that aim to understand the wide-reaching impacts of trauma on a child by addressing the social, emotional, and academic well-being of the student in a specialized, intentional, and equity-driven way. Based off of the research, trends consistently showed the importance of teachers being educated in the area of trauma, offering students support that builds their social and emotional skills, and creating a safe classroom environment. These trends point to the practices' ability to strengthen children with ACEs' developmental, academic, and emotional well-being. Trends demonstrate the ways these practice level the field for students with ACEs thus positively interrupting inequity in education.

*Keywords: Trauma, child development, education*

---

## Introduction

Inequity in schools is an issue with far reaching implications and stems from a multitude of sources. One source is from adverse childhood experiences (ACEs) which can have severe consequences on a child's behavior, understanding of the world, and their expression. ACEs cover a vast range of traumatic occurrences within a child's life including abuse, neglect, and household dysfunction. Within each of these categories are the specific ACEs: physical abuse, emotional abuse, sexual abuse, physical neglect, emotional neglect, mental illness, violent treatment of the mother, divorce, substance abuse in the home, or paternal incarceration. Trauma from ACEs can have short-term and long-term consequences. Such experiences in a child's life can contribute to lifelong health concerns as continued loops of stress hormone activation surging through the body create a state of being mirroring that of "survival mode" thus creating long-term concerns for cardiovascular disease, anxiety, and depression and short-term concerns over reactions to stressful situations (Burke Harris 2014). This toxic stress cycle largely contributes to concerns of trauma within a person's life and is of great concern when thinking about children in the classroom. Because trauma can root itself in various aspects of a child's life, it is important to recognize that school is no exception. Trauma informed education practices aim to combat some of the implications of a child's life by bringing awareness, appropriate responses, and alternative solutions to students with ACEs (Hurd et al. 2019). Within this project, it is hypothesized that if trauma informed education practices are implemented in the classroom, then they will positively combat inequity within schools.

It is important to establish why trauma informed practices have an equity-based focus by contextualizing the inequity it can bring about. Based on research of ACEs, the issue of trauma impacting children is prevalent since nearly 47% of children in the U.S. have one ACE and 22% have

more than one ACE (Bethell et al. 2017). This prevalence is important to establish because studies show that there are correlations between ACE prevalence and other factors such as socioeconomic status, race, and geographic location (Whiteside-Mansell et al. 2019). Introducing the distribution of ACEs in children makes this issue all the more important considering not all students will walk into the classroom with the same emotional, physical, and social needs met.

In an effort to understand ACEs, their relationship to schools and inequity, and the ways in which schools can support these students, this project focuses on three core research questions. These questions are: what are trauma informed education practices, how can they combat inequity in schools, and how can they be applied in the classroom. By looking at each of these questions in depth and unpacking the weight the data of past studies and academic works hold, I aimed to answer each of these questions while pointing to the bigger picture they collectively point to: making education a place for all.

## Methods

This project followed the meta-analysis research design. With this design, I investigated various literature that was already available on the topic. In alignment with this type of design, I then took the information from various sources to synthesize, analyze, and compile information from them. This design was chosen so I could focus more on the application of the topic rather than formulate additional information on the topic. The meta-analysis design allowed me to present the existing data in a meaningful and coherent way that made it useful and assessable for educators. This project had no external participants, and the materials were also minimal. These materials included internet access, a computer, reliable search engines and databases, and various literature on the topic. The search engines and databases used were the Stanislaus State Library OneSearch and Google. All

materials found through these search engines had to be credible, scholarly, and up to date in order to acquire the most accurate information. Filters within the search engines were used to refine the data being provided. The literature came in the form of previous studies on the topic, scholarly articles that discussed trauma informed education practices, videos on trauma, and books that not only defined trauma but also detailed certain developmental problems associated with it. These were chosen based off of their relevance, perspective, and ability to communicate meaningful results.

To conduct this project, I broke up the topic of research into three categories as to narrow the focus. These subcategories were: what is trauma informed education, how can trauma informed education combat inequity, and how can trauma informed practices be implemented in the classroom. Once established, I began research by finding scholarly articles and studies related to the field of inquiry. Once these articles were found, I began reading through the various literature on the topic and pulled out the most compelling information that was relevant to the three categories of focus. After relevant information was pulled from these sources, I synthesized the findings in order to address the questions at hand. Each research focus contributed to the next, so conclusions were made in the order in which the questions were posed. In this way, the information that answered the question prior, contextualized the information that could follow thus creating a focused and connected piece.

**Results**

The purpose of this research project is to determine the correlations between trauma informed education practices and combatting inequity in schools through investigating three essential questions: what are trauma informed practices, how can they combat inequity, and how can they be applied in the classroom. The practices aim to negate some of the negative outcomes of adverse childhood experiences through their equity and justice-based focus while pointing to practical means of leveling the academic playing field for students and therefore making education a place for all.

The results of this project correlated with both the hypothesis and the three research questions. It was hypothesized that if trauma informed education practices were implemented in the classroom, then they would positively combat inequity in schools, and trends within the various data and sources pointed to this same conclusion. By breaking the research down into three parts, the data was able to contribute to a narrowly focused subdivision to collectively point to the bigger picture of making education a place for all.

*Defining Trauma Informed Practices in Education*

The first question of focus asked what trauma informed education practices are. It was important to define these practices as the initial research question in order to contextualize its place within education and extend the concluded definition within the contexts of the other two research questions as well. After reading the various literature and studies that laid the foundation of this project, several trends arose that helped shape a definition that could

be extended to the rest of this project.

Several trends hinged on key features such as a teacher being educated in the impacts of trauma on children, offering students chances to practice social and emotional skills, and creating a safe environment in which the students can learn (See Figure 1). Studies indicated that trauma informed practices require awareness of trauma, positive responses to children with ACEs, and equitable support for these students (Hurd et al. 2019). With this said, I was able to conclude that these practices focused more on holistic and individualized support. Rather than relying on other commonly practiced approaches such as behaviorism, these practices look to the core of the behavior and not just the consequences of it (Sprik 2013 p. 8-9).

The trends that arose in the research pointed to three core features of these practices: understanding trauma, supporting a child developmentally, and teacher intentionality towards equity and care. From these generalized trends, an overarching definition was concluded and written (See Figure 2). This definition worked to account for the various aspects of these practices based on the research conducted. Together, the trends from the research and the definition for these practices began to uncover the issue of inequity while also pointing to the applications of these practices.

| TRENDS OF A TRAUMA INFORMED CLASSROOM  |
|--|
| Teacher has an awareness of trauma and its impacts on a child's development                    |
| Behavior is addressed in a constructive and holistic way                                       |
| Social and emotional skills are taught or intermingled in curriculum                           |
| Support is offered to students in an effort to build a sense of belonging.                     |
| Relationships play an important role in the classroom  |
| Communication is clear, open, and honest   |
| Teachers offer a safe classroom environment that gives students consistency and predictability |

*Figure 1: Listed trends that contributed to defining these practices.*

| Definition  |
|---|
| Practices that aim to understand the wide-reaching impacts of trauma on a child by addressing the social, emotional, and academic well-being of the student in a specialized, intentional, and equity-driven way. |

*Figure 2: Concluded definition*

*Combatting Inequity in Schools*

The second question of this research project revolved around how these practices can combat inequity in schools. It was first important to establish the inequity factor of the project within this section of the research, for if there was not a concern of inequity, then much of this research would be void. However, several sources pointed to a clear discrepancy not only in adverse experiences amongst children with differing ethnic, socioeconomic, and

geographic backgrounds, but also in the issues they faced as a result of these experiences in comparison to their peers without them. Data from HRSA's 2016 National Survey of Children's Health helped explain adverse experiences bring in an element of inequity by pointing to such discrepancies. Nationally, the survey found that when broken down by race, ACE score distribution was not equal. 40.9% of white children, 51.4% of Hispanic children, 63.7% of black children, and 25% of Asian children experienced one or more ACEs (Bethell et al. 2017). The discrepancies amongst children of different ethnicities is further seen when looking at the percentages of children with two or more ACEs. 19.2% of white children, 21.9% of Hispanic children, 33.8% of black children, and 6.4% of Asian children experience two or more ACEs (Bethell et al. 2017). In terms of the results of this project, this data pointed to the importance of this research since the issue is prevalent amongst so many children but unevenly distributed by race, making many students from minorities more disadvantaged socially and emotionally in comparison to their peers.

Unequal distribution proved to go beyond just race, however. Based on the HRSA's 2016 National Survey of Children's Health, 58% of children with ACEs are from households that have income levels that are less than 200% of the federal poverty (Bethell et al. 2017). Furthermore, students from poorer areas geographically also experienced more risk factors that could lead them to experience ACEs more frequently (Whiteside-Mansell et al. 2019). From this research, I was able to conclude that the issue of inequity was clearly a multi-faceted concern and was of the utmost concern when thinking about students from poorer areas, low socioeconomic families, and racial minorities.

With this data supporting an unequal distribution, it was also important to research the negative implications of trauma in order to explain why this is an issue of inequity. Several sources pointed to the negative impacts of implications such as toxic stress, chronic absenteeism, or the school to prison pipeline which all can be an issue in the world of education. Having one or more ACE was shown to correlate to both chronic absenteeism and likelihood of incarceration due to schools' choice in disciplinary actions or support (Stempel et al. 2017, Skiba et al. 2014). Establishing these larger negative implications pointed to the importance of reducing the foundational implications that teachers can help buffer in hopes of minimizing consequences such as dropout or later incarceration.

With this said, many studies suggested that trauma informed practices can combat such issues and act as a buffer for these negative implications, thus adding support to the hypothesis that they can combat some of the implications (See Figure 3). By comparing the negative impacts of trauma with the positive benefits of these practices, the result was a clear explanation of how these practices can combat inequity in schools. By offering the holistic care and opportunities for development, these practices help students with otherwise compromising disadvantages experience education on a more level playing field. The research of past studies explained how these practices can boost the skills needed to cope with stress and emotional regulation, increase skills in students, reduce stress within learning, and overall boost academic support.

Development of skills specifically in the area of emotional regulation pointed to importance of these practices since they offer students transferable skills that they can take with them outside the classroom (Bulanda & Bryo Johnson 2014). In this way, the second research question on how these practices can combat inequity was concluded by the ways in which these practices support students academically, emotionally, and developmentally ultimately negating some of the negative implications they may otherwise face as inhibitions to their learning and academic experience. These practices take a developmental and holistic approach to these otherwise negative implications thus they help the students, teachers, and academic experience for both.

| NEGATIVE IMPACTS OF CHILDHOOD TRAUMA  | TRENDS OF THE BENEFITS OF TRAUMA INFORMED PRACTICES                         |
|---|---|
| Health problems (i.e.: increased risk for cardiovascular disease, toxic stress) | Learning coping skills and mechanisms for stress and emotional regulation   |
| Social skill deficits   | Increased skills in leadership, capacity, and self-efficacy                 |
| Anxiety or depression   | Security in the classroom environment (which can reduce stress or triggers) |
| Difficulty focusing in class  | Academic support  |
| Decreased self-esteem   | Increased self-esteem   |

**Figure 3:** A comparison of negative impacts of childhood trauma and trends of benefits from trauma informed practices

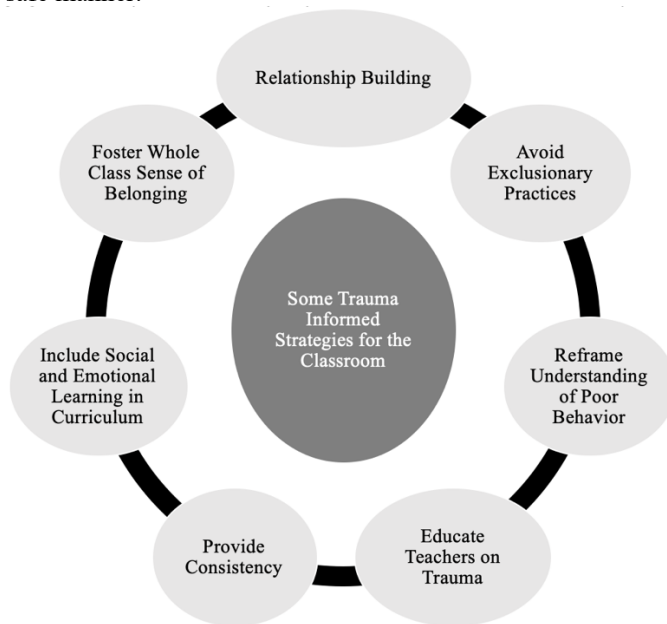
#### Applications of these Practices

The final research question of this study aimed to find practical applications for these practices within the classroom. Based on the preestablished definition of these trends and the literature used in this study, several applications for these strategies emerged to answer this question (See Figure 4). Within these specific strategies, core elements such as classroom predictability and stability, social and emotional learning within curriculum, and focus on relationships proved to be effective in helping students. Predictability and stability in the classroom is important in helping students with ACEs because it can minimize stress from the unknown. A trauma-sensitive classroom is one that offers a learning environment and routine that makes every student feel safe, healthy, and supported (Souers & Hall 2016 p.3). Providing students with a schedule, routine, or otherwise predetermined expectancy for their day proved to be helpful in allowing these students to feel more at ease and more in control of their learning.

Classrooms that focus on social and emotional learning additionally helped support these students by providing them a holistic approach to their education and discipline; this focused on social and emotional developmental deficiencies students may have and positively equipped them with strategies for success and emotional regulation. Incorporating these aspects in the

curriculum may look as simple as doing a lesson on communication or be as expansive as practicing mindfulness practices within the classroom.

Similar to this focus on social and emotional learning, relationship building offers these students consistent and caring relationships they may not have at home. From my research, it was clear that the teacher-student relationship is one of the most important relationships within the classroom in helping these students since it provides them an adult they can trust and look up to. Incorporating chances to build relationships within the class helps students feel a sense of belonging and develop other skills they may not otherwise learn about in a healthy and safe manner.



**Figure 4:** Some applications of these practices for the classroom.

Ultimately, the results of this research pointed to the importance of this research while also correlating to the focus of this project as a whole. Each research area dove deeper into the topic while building upon the earlier topic and laying the foundation for the next. Importantly, these results pointed to the practical applications of this research meaning there are effective strategies that educators can use to help their students of varying backgrounds and make education a place for each of them. Each research focus worked towards pointing to the grander concern of how educators can make education a place for all while providing students key moments of growth and academic support.

## Discussion

Carrying the weight of children’s well-being and academic success, this project sheds light on an important topic that is not discussed enough within education. Recent focus in the area of mental health within education has begun to expand on similar topics which opens the door for further conversations on how best to support children with adverse childhood experiences.

This project’s importance is two-fold. First, it points to an inequity within the system of education. This means that the research demonstrates a clear concern that

students may not be coming into the classroom on the same footing. This is of great importance when considering the data pointed to students from poorer areas, low socioeconomic families, and racial minorities. Nonacademic systemic concerns already exist for children of these demographics which means they are already fighting an uphill battle. This project hopes to uplift these children within the field of education in order to negate some of the otherwise concerning disadvantages they already face. These children deserve the care and investment needed to help them find their footing academically and developmentally. Importantly, this project makes the distinction that the experiences of children demands a more holistic approach to their education. Rather than focusing on the students’ behavior within the classroom, this project attempts to show the importance of addressing the causes of the behavior. If students with adverse experiences are not met with this type of intentional support, the inequity is further perpetuated since they may lack the social, emotional, and regulatory skills their peers have. The implications of trauma will follow them throughout their lives, but this project aims to point out that schools can be an important buffer in the manifestation of these implications. Not only will this help the students academically, but it will lead them towards a lifelong development.

The second point of importance within this study is that it points to clear applications that can begin to reshape the ways in which education is seen and handled. It gives educators an opportunity to see the potential to change children’s lives while also giving them the strategies in order to do so. In this way, the project acts as a sort of call to action for the education community by providing evidence of the issue, concerns for its implications, and making a case for why it needs to be addressed. It should be concerning and therefore cause a response. The equity driven nature of this study and the concern for children’s overall success and well-being paired with the applications this study offers brings the issues it addresses to light.

This study has implications within the field of education and child development. The issues brought up in the study should signal to educators its overall importance. Not only does it have the chance to positively change a child’s life, it also offers the chance to make school a more productive place of growth. Ensuring that students are cared for developmentally while progressing academically shows the constructive nature of the application of this study. Outside the field of education, this study ties to the field of child development since it focuses so heavily on meeting the developmental needs of children. By drawing conclusions from the field and previous studies, this project serves as a bridge between what the field of child development already points to and the practical applications trauma informed education practices can have.

At the heart of this study is the hope of spreading awareness of the importance of trauma informed practices in schools in an effort to shed light on the ways in which education can offer students an equitable chance for success both inside and outside the classroom. Educating teachers and administrators on the implications of trauma is one of the ways in which this solution can arise for awareness can

bring about the change students with adverse childhood experiences need. With all this said, the importance of this study lies in the importance of changing students' lives and offering them the opportunities for growth and development within the classroom they need. Making education a place for all means making education a place where students are cared for, supported holistically, and grow at every level. This research invites educators and school systems alike to do just that.

### Limitations

This research does have some limitations as its meta-analysis design can have some shortcomings in a project of this breadth. First, it is important to note that while trauma is heavily researched and studied, the specific field of trauma informed education practices is not. With this said, many conclusions were drawn based on the limited academic material available. Another limitation of the research is the overall lack of focus on the positive benefits children can experience as a result of these practices being implemented. While many sources pointed to clear positive trends, the specifics of these trends did not move beyond commonly known outcomes of proper care and fostering of a child's development. With these limitations said, the research was able to overcome some of these hinderances by looking at source material collectively rather than individually. In doing so, the general trends found in studies worked together to detail a bigger picture from which conclusions could be drawn.

### Future Work

This research discusses some of the in-classroom ways in which educators can support students socially, emotionally, and academically. With this said, future research may investigate ways in which schools can help their students with adverse childhood experiences through resources outside the classroom. The research can explore different school environments and campaigns that can contribute to the overall well-being of the students. To take this study even further, future research may consider ways in which schools and educators can provide support for students at the home level. Applicable means of supporting the family, guardians, and basic needs of the child may shed additional light on how to combat inequity faced by students with adverse childhood experiences.

### Acknowledgements

I would like to thank the California State University, Stanislaus' Honors Program for allowing such research to occur. I would also like to thank my two Honors Program professors, Dr. Suditi Gupta and Dr. Jamila Newton, for their help and guidance throughout the research process. Their feedback and mentorship helped shape this project. In addition, I would like to thank Professor Pamela Young for being a supportive faculty mentor. Finally, I would like to thank the English and Child Development Department for providing me the foundation needed for this research.

### References

- [1] Bethell, CD, Davis, MB, Gombojav, N, Stumbo, S, Powers, K. Issue Brief: Adverse Childhood Experiences Among US Children, Child and Adolescent Health Measurement Initiative, Johns Hopkins Bloomberg School of Public Health, October 2017: [cahmi.org/projects/adverse-childhood-experiences-aces](https://cahmi.org/projects/adverse-childhood-experiences-aces)
- [2] Bloomberg, N. Effective Discipline for Misbehavior: In School vs. Out of School Suspension. *Department of Education and Human Services Villanova University*. (2013).
- [3] Bulanda, J., Byro Johnson, T. A Trauma-Informed Model for Empowerment Programs Targeting Vulnerable Youth. *Child Adolesc Soc Work J* **33**, 303–312 (2016). <https://doi.org/10.1007/s10560-015-0427-z>
- [4] Burk Harris, N. (2014). How childhood trauma affects health across a lifetime. [Video File] Retrieved from [https://www.ted.com/talks/nadine\\_burke\\_harris\\_how\\_childhood\\_trauma\\_affects\\_health\\_across\\_a\\_lifetime/discussion?referre=playlist-how\\_does\\_my\\_brain\\_work](https://www.ted.com/talks/nadine_burke_harris_how_childhood_trauma_affects_health_across_a_lifetime/discussion?referre=playlist-how_does_my_brain_work)
- [5] Ellis Hurd, Kathleen Brinegar & Lisa Harrison (2019) Understanding trauma-informed practices, *Middle School Journal*, 50:4, 23, DOI: [10.1080/00940771.2019.1651554](https://doi.org/10.1080/00940771.2019.1651554)
- [6] Russell J. Skiba, Mariella I. Arredondo & Natasha T. Williams (2014) More Than a Metaphor: The Contribution of Exclusionary Discipline to a School-to-Prison Pipeline, *Equity & Excellence in Education*, 47:4, 5-564, DOI: [10.1080/10665684.2014.958965](https://doi.org/10.1080/10665684.2014.958965)
- [7] Souers, K., & Hall, P. (2016). *Fostering resilient learners: Strategies for creating a trauma sensitive classroom*. ProQuest Ebook Central <https://ebookcentral.proquest.com>
- [8] Sprick, R. S. (2013). *Discipline in the secondary classroom: A positive approach to behavior management*. ProQuest Ebook Central <https://ebookcentral.proquest.com>
- [9] Stempel, H., Cox-Martin, M., Bronsert, M., Dickinson, L. M., & Allison, M. A. (2017). Chronic School Absenteeism and the Role of Adverse Childhood Experiences. *Academic Pediatrics*, 17(8), 837-843. doi: 10.1016/j.acap.2017.09.013
- [10] Whiteside-Mansell, L.; McKelvey, L.; Saccente, J.; Selig, J.P. Adverse Childhood Experiences of Urban and Rural Preschool Children in Poverty. *Int. J. Environ. Res. Public Health* 2019, 16, 2623.





# The Effects of the Flipped Classroom Teaching Method: How it Impacts Motivation, Performance, and Satisfaction in the Classroom

Timea Friesen

*B.A. Candidate, Department of English, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

Received 16 April 2021; accepted 20 July 2021

---

## Abstract

The flipped classroom pedagogy has rapidly gained educators' attention over the past decade. Its potential to reinvent the classroom makes the flipped classroom a popular candidate for research, particularly in regard to researching and analyzing data in a variety of circumstances: grade levels, subjects, personality types, activity types, etc. This study focuses on the flipped classroom's effects on student motivation, student performance, and student and teacher satisfaction. Meta-analysis of previous research shows that the flipped classroom may be beneficial to these categories of achievements and attitudes. A small case study of educators in various fields from middle school to college level contributes to the positive sentiments surrounding the effectiveness of the flipped classroom model, but the results are not conclusive. This paper evaluates how the flipped classroom can be effectively utilized as an instructional tool to modify the functions of work done within the classroom, but a variety of factors also contribute to motivation, performance, and satisfaction.

*Keywords: flipped classroom, motivation, performance, satisfaction*

---

## Introduction

Education methods change frequently and rapidly as teachers strive to equip their students for the rigorous demands of the ever-changing outside world. Advances in technology allow for alternative teaching methods to be developed, and they often require teachers to adapt to ensure that their students are well-versed in technology. Furthermore, the realm of education was forced into limbo during the Covid-19 pandemic, causing teachers to reach for new teaching strategies. One new method that was developed in the Internet era is the flipped classroom teaching model, and it has been gaining substantial popularity among teachers and education experts both before and especially during the school closures. It entails presenting the bulk of the instruction outside of class and using class time to interact with the material. This gives teachers more creative freedom with their lesson plans, potentially making them more interactive and student oriented. Many teachers implement this model by assigning instructional videos as homework and then applying the concepts in class in further depth through activities and lessons. The main intention behind the flipped classroom teaching method is to delve deeper into the material and to have a more interactive classroom environment. However, is it successful in these endeavors, and how beneficial are these potential outcomes? How is the flipped classroom teaching method influencing student motivation, academic performance, and teacher satisfaction? Understanding the specific impacts of the flipped classroom will allow teachers to make educated decisions as to how well the teaching method will suit their respective needs and how to best apply the method in their classrooms if they choose to do so.

## Literature Review

Since the teaching method is fairly new, Abeysekera and Dawson (2015) consented that the flipped

classroom requires further research in order to understand the method's wide-reaching effects, but it aided in defining the specifics of what the method is based on and the possible reasons to support it. As far as definition goes, the flipped classroom is a new concept in education, but some of the practices that are considered "flipped" have been around for quite some time (Abeysekera & Dawson 2015). For example, studying a textbook or an article at home and then interacting with it in class is not a new idea in education. Rather, the buzz around the flipped classroom is due to the fact that the method revolves around highly interactive class activities and the bulk of the "textbook" learning being done independently outside of class (Abeysekera & Dawson 2015). This extreme flip may be beneficial, but it could have potential downsides. The article took a theoretical approach to the concept, so the results were inconclusive, but it discussed the possibility that the method may boost student motivation and lighten cognitive load which will be important themes to focus on in further research (Abeysekera & Dawson 2015 p. 2).

The article by Alsancak and Ozdemir (2018) conducted a research study to examine these themes in further detail. This study focused on the impact of the flipped classroom model by comparing a class using the model with a control group. While the study was conducted to achieve a broader sense of the effectiveness of the innovative method, it also sought to identify the specific influence of the method on academic achievement, motivation, and "self-directed learning readiness" (Alsancak & Ozdemir). The research study consisted of sixty-six students at Ahi Evran University split into two groups enrolled in the same course: one group was using a flipped classroom while the control group was using a classical blended learning method. The study found a statistically significant difference between the flipped classroom and the control group in terms of academic achievement, retention, and motivation, with the flipped

classroom having higher rates of all three (Alsancak & Ozdemir 2018 p. 76). There was not much difference between the two regarding self-directed learning readiness. This individual study brings to light the potential successfulness of the flipped classroom in regard to boosting academic performance and student motivation. Furthermore, Talan and Gulsecen (2019) used qualitative and quantitative measurements to demonstrate that the flipped classroom method can improve academic achievement, engagement, and satisfaction. They conducted a study in which there were two experimental groups using the flipped classroom method and one control group using a blended model. The flipped classroom group learned the material before class and participated in active learning during class, and the control group learned the material in class and completed the active learning activities outside of class. At the study's conclusion, the flipped classroom yielded higher scores for academic achievement and engagement (Talan & Gulsecen 2019). Students also expressed satisfaction with the flipped classroom. Talan and Gulsecen's study provides additional concrete evidence for the flipped classroom's positive impact on academic performance as well as student interest and satisfaction.

Expanding on student satisfaction, Shahnaz and Hussain (2016) examined how students with different styles of learning respond to the flipped classroom model. The purpose of their research was to design a classroom using the flipped classroom model that still took into account all learning styles, especially introverted students' learning styles since the flipped classroom environment is highly social. An instructional design was tested and revised multiple times, and after the design was tested on a group of twenty-four students, their study found that "Qualitative findings via observation showed that despite a learning curve, the finalized instructional design was able to facilitate different learning styles satisfactorily" (Shahnaz & Hussain 2016 p. 147). There were also additional benefits including "learner empowerment, engagement, motivation and improved communication and thinking skills" (Shahnaz & Hussain 2016 p. 147). This study shows the flipped classroom's potential, especially if altered to accommodate all student personality types present in a given classroom.

Another study that discusses the flipped classroom's possible positive effects used data collected from an experimental research study where the flipped classroom pedagogy was applied to a teacher education course. For the purposes of the study, postgraduate-level student teachers were separated into two groups: one utilizing a flipped classroom pedagogy and the other utilizing direct instruction (Van Wyk 2019). At the conclusion of the study, researchers found that the flipped classroom group achieved higher scores on the final exam, and the performances and perceptions of the students in the flipped classroom group were reportedly stronger (Van Wyk 2019). The flipped classroom group also possessed a more collaborative environment, and the study found the teacher's role to be instrumental in the success of the method (Van Wyk 2019).

Similarly, a research study by Sun and Wu noted

the differences between a flipped classroom group serving as an experimental group and a distance learning group serving as a control group (2016). At the conclusion of the study, the flipped classroom group achieved higher scores in the category of learning achievement, but there was no significant difference in regard to the other measures of learning effectiveness: teacher-student interactions and learning satisfaction (Sun & Wu 2016). The researchers commented that the flipped classroom allowed for more effective collaboration and interaction than distance learning, and there was more emphasis placed on the process of learning than on the learning's outcome. Overall, the ability to engage with students face-to-face enhanced the learning experience which is an important thing to note. Some teachers may need to decide between a flipped classroom and a fully online classroom, so this study would be helpful to reference.

Teachers most often must choose between a flipped classroom and a traditional classroom, so Låg and Saele's review and analysis would also be important for deciding teachers to reference (2019). Their research was focused on the outcomes of continuous learning measurements, pass and fail rates, and student satisfaction with teaching (Låg & Saele 2019). In order to obtain data, Låg and Saele searched and meta-analyzed research on the flipped classroom and the traditional classroom (2019). Their analysis of this research was that the flipped classroom is slightly more effective in regard to the three categories of the learning process (as mentioned above), and Låg and Saele encouraged teachers to test student preparation since this improved the impact on learning (2019).

Another study compared the flipped classroom to the traditional classroom in an experimental research study, and it found the flipped classroom to be advantageous in the areas of student learning progress, student satisfaction, and teaching satisfaction (Unal & Unal 2017). In this study, sixteen teachers utilized the flipped classroom teaching model in their classes for the first time. Academic performance was measured by pretests and posttests, and the student and teacher satisfaction were measured by survey responses. Researchers Unal and Unal came to the conclusion that "if the conditions are properly set, the flipped classroom should have the potential to be an extremely effective learning style" (2017 p. 145). This study was especially insightful because it documented the opinions of teachers who had not previously practiced the flipped classroom pedagogy.

Another insightful research experiment comparing the flipped classroom and the traditional classroom found a significant difference between student successes in favor of the flipped classroom (Holik 2019). The experiment separated twenty-four culinary students into two groups: a traditional group focused on the teacher and a flipped classroom group focused on the students. The average of student grades was four percent higher in the flipped classroom group, and the group's grades were higher over the course of the semester as well. The researchers argued that the study helped "establish a foundation of evidence that student engagement and academic success improve in the flipped classroom for culinary arts CTE students"

(Holik 2019 p. 74). Understanding how the flipped classroom fairs in a variety of learning environments aids in discovering its overall success as well as its most effective usages.

Furthermore, a study by Kim and Jung found that “implementing problem-centered instructional activities, accompanied by desirable challenges, is highly advisable to foster deep engagement” (2016 p. 1). Their study was intended to discover the most effective instructional activities to incorporate into the flipped classroom design, so the focus was centered upon the in-class portion of the flipped classroom, rather than the online learning material (Kim & Jung 2016). The study found the types of learning activities utilized in the classroom to be of high importance, as students gained more from learning activities promoting higher-order learning. Specifically, this means that lessons focusing on demonstration and application are less effective than the previously mentioned problem-centered activities (Kim & Jung 2016). This will be important to keep in mind throughout my research since the types of activities employed in the classroom play an active role in the method’s success.

When taking into consideration the information presented in the reviewed literature, the flipped classroom appears to positively correlate with student motivation, academic performance, and student and teacher satisfaction. Further research is required to pinpoint specifically how exactly the method improves these categories and how teachers can ensure success when implementing the flipped classroom. Based on this literature, my hypothesis is that the flipped classroom will prove to be effective in the areas of student motivation, academic performance, and student and teacher satisfaction, in both my own findings and my continued research.

## **Methods**

**Participants:** To conduct this study, I recruited three educators ranging from middle school to college level who currently practice the flipped classroom method in their instruction, having switched from using the traditional classroom model previously. The participants are as follows: one middle school English teacher at Hickman Middle School in Hickman, California; one high school social science teacher at James C. Enochs High School in Modesto, California; and one university mathematics professor at CSU Stanislaus in Turlock, California. The classes who used the flipped classroom method included sixth grade language arts, seventh grade language arts, tenth grade world history, twelfth grade U.S. Government, college freshman-level finite math, and college senior-level Calculus.

## *Materials*

Participants freely responded to eleven open-ended questions, allowing for an accurate means to gauge their experience with the flipped classroom and how it affected the class’s motivation and performance as well as the teacher’s overall satisfaction and perceived student satisfaction. An example question is as follows: “Were you satisfied with the results of implementing the flipped

classroom in your instruction?” The complete list of interview questions can be located in Appendix A.

## *Procedure*

After signing and returning a consent form, the participants participated in twenty to thirty-minute interviews via zoom in which they freely responded to the eleven open-ended questions. The audio of the interview was recorded and later transcribed. Participants also had the option of writing responses if they felt more comfortable submitting a written response; one participant opted for this alternative interview method. After the data had been accumulated, synthesizing it required transcribing the audio and reading through responses and finding commonalities between them, thus obtaining qualitative data.

## *Design*

The data obtained from the interviews will be qualitative, meaning that common themes and common experiences would need to be identified, provided there were common themes and experiences to be found. If the findings could not be accurately linked together, the data would only serve analytical purposes.

## *Expected Results*

It was hypothesized that a majority of participants would attribute increased motivation, performance, and satisfaction to the flipped classroom. Additionally, it was expected that responses would vary depending on the teacher’s usage of the method, and a goal of the study was to point to the most effective practices of the flipped classroom. Overall, it was expected that the case study would render support for the flipped classroom and suggest the most effective situations for using a flipped classroom.

## **Results**

Studying the effects of the flipped classroom teaching method allows educators to make informed decisions regarding their instruction. In this study, it was expected to find a positive correlation between the flipped classroom and student motivation, student performance, and student and teacher satisfaction. My above-mentioned hypothesis was proved partially correct: the concrete results of the case study point to potential positive impacts on these criteria, but most teachers were hesitant to attribute all of their success in the classroom to the flipped classroom method itself.

In regard to improved academic performance, two out of the three educators claimed that the flipped classroom undoubtedly improved their students’ measurable success in the classroom. When it came to student motivation, the instructors were not as sure. Two out of three of the educators were unsure whether student motivation improved and could be attributed to the flipped classroom, while one teacher wholeheartedly claimed that the flipped classroom improved student motivation. Teachers expressed that they believed that their students were satisfied with their learning, but they are always looking for ways to improve the student experience. Similarly, two thirds of the teachers were wholeheartedly satisfied with the teaching method and

one teacher was still looking to improve it.

While these results comment on the three criteria used in this study to determine the flipped classroom's effectiveness, they are not statistically significant due to the small sample size. However, the interviews were able to address other aspects of the flipped classroom that could not have been identified without the open-ended nature of the case study. In addition to the flipped classroom potentially positively impacting motivation, performance, and satisfaction, teachers also attributed other benefits to the flipped classroom including better time management of class time, increased collaboration and interaction, improved retention of material, and better usage of technology. These were common themes present in all interviews alongside the sentiment that the flipped classroom is merely a tool to achieve these things: it is not a guarantee that such benefits will be attained.

### Discussion

The hypothesis from this study was partially correct, but there are many other key concepts and ideas that can be drawn from this study, providing further commentary and feedback on the flipped classroom pedagogy. One of the most important conclusions that the research provided was that the flipped classroom is effective, but the means in which it is effective varies. The criteria used to evaluate its effectiveness may need to be adjusted to provide more substantial results. In continued research, it would be perhaps worthwhile to test the prevalence of the interviews' themes on a broader scale.

The proposed audience for this research project is teachers who have an interest in using the flipped classroom teaching method, and the conclusions of this research partially affirmed the flipped classroom's effectiveness in the classroom in terms of motivation, performance, and satisfaction. With continued research and additions to the literature on the flipped classroom, teachers will be able to make better educated decisions on whether or not this method is best for their class, and they will be able to choose how to best implement the method if they so desire.

### Acknowledgements

Thank you to my mentor, Professor Karen Zandarski, for your continued support and assistance with this project.

Thank you to the University Honors Program for the opportunity to conduct this research study.

### References

- Abeysekera, L., & Dawson, P. (2015). Motivation and cognitive load in the flipped classroom: Definition, rationale and a call for research. *Higher Education Research and Development*, 34(1), 1-14. doi: <http://dx.doi.org/10.1080/07294360.2014.934336>
- Alsancak Sirakaya, D., & Ozdemir, S. (2018). The effect of a flipped classroom model on academic achievement, self-directed learning readiness, motivation and retention. *Malaysian Online*

*Journal of Educational Technology*, 6(1), 76-91. Retrieved from <http://libproxy.csustan.edu/login?url=https://search.proquest.com/docview/2013522564?accountid=10364>

- Holik, M. (2019). The Flipped Classroom and Its Impact on Student Engagement and Academic Performance in a Culinary Arts, Career and Technical Education Program. *Journal of Research in Technical Careers*, 3(2), 74–96.
- Kim, M., Jung, E., de Siqueira, A., & Huber, L. (2016). An Investigation into Effective Pedagogies in a Flipped Classroom: A Case Study. *International Journal of E-Learning & Distance Education*, 31(2).
- Låg, T., & Saele, R. G. (2019). Does the Flipped Classroom Improve Student Learning and Satisfaction? A Systematic Review and Meta-Analysis. *AERA Open*, 5(3).
- Shahnaz, S. M. F., & Hussain, R. M. R. (2016). Designing Instruction for Active and Reflective Learners in the Flipped Classroom. *Malaysian Journal of Learning and Instruction*, 13(2), 147-173.
- Sun, J. C.-Y., & Wu, Y.-T. (2016). Analysis of Learning Achievement and Teacher-Student Interactions in Flipped and Conventional Classrooms. *International Review of Research in Open and Distributed Learning*, 17(1), 79–99.
- Talan, T., & Gulsecen, S. (2019). The Effect of a Flipped Classroom on Students' Achievements, Academic Engagement and Satisfaction Levels. *Turkish Online Journal of Distance Education*, 20(4), 31–60.
- Unal, Z., & Unal, A. (2017). Comparison of Student Performance, Student Perception, and Teacher Satisfaction with Traditional versus Flipped Classroom Models. *International Journal of Instruction*, 10(4), 145–164.
- Van Wyk, M. M. (2019). Flipping the Economics Class in a Teacher Education Course. *Technology, Knowledge and Learning*, 24(3), 373–399.

### Appendix A

- Flipped Classroom Research Interview Questionnaire
1. Can you briefly describe your experience using the flipped classroom teaching method in your classroom?
  2. How did you implement the flipped classroom in your class(es)?
  3. Why did you choose to implement the flipped classroom in your class(es)?
  4. Did you notice any changes in student motivation after implementing the flipped classroom method? If yes, in what ways/which areas?

5. Was student academic success and performance impacted in any way? Did you notice any changes in student scores or grades?
6. Do you believe that the flipped classroom had any effect on students' retention of material?
7. Did the flipped classroom teaching method change the culture or environment of the classroom?
8. Did the flipped classroom impact student attitudes toward subject matter?
9. Were you satisfied with the results of implementing the flipped classroom in your instruction?
10. Did your students seem satisfied with the instruction that they received?
11. Would you change anything about how you used the flipped classroom in your class(es)?

# Why Does Female Genital Mutilation Continue to be a Social and Cultural Drive?

Cristal Fuentes

*B.A. Candidate, Department of Psychology, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

Received 16 April 2021; accepted 20 July 2021

---

## Abstract

Cultural practices are a way for many communities to display their history and continue a tradition that has long been created. However, some cultural traditions still retain some practices that no longer match the morals of today's society. Human rights are set in place all over the world in order to allow freedom for all individuals regardless of their socioeconomic status. Many of the abuses occur in developing countries because of the lack of resources and structure to prevent it from happening. Examining education in regard to the knowledge of this practice and the human rights violations imbedded within it affirms the importance of potentially raising awareness and increasing support of apprehending the issue. This study explores how effective the level of education and age can be toward increasing support against cultural issues, more importantly, abuses within female genital mutilation (FGM). In order to determine the effectiveness of education, a study will be conducted with a diverse target population. Specifically looking at age, their level of education, and their willingness to support preventative measures (i.e., signing petitions, donating, and further research). The results of the study indicated that participants with a bachelor's degree or higher showed the most willingness to support preventative measures. Furthermore, ages 45-65 with a doctorate degree displayed the most knowledge and agreeableness than any other age range. However, participants 18-24 with some high school attendance and/or diploma were less inclined to agree to support such measures.

*Keywords: Human Rights, Female Genital Mutilation, Culture, Traditions*

---

## Introduction and Background

Human rights are an integral part of our human existence and a form of peace among nations. It affects our lives in such a way that allows us to live to a higher standard than was not feasible in the past. However, if we examine specific cultural traditions present still today, we will see a complete disregard for that ideal. Although some cultural practices evolve to match the morals and ethics of modern society, others retain the same methods that would be seen as cruel and inhuman to those that are not educated on their reasonings or beliefs. In order to gain perspective on such cultures, this research will focus on human rights abuses in cultural practices specifically as it pertains to Female Genital Mutilation (FGM). Female genitalia mutilation is a traditional harmful practice that involves the partial or total removal of external female genitalia or other injuries to female genital organs for non-medical reasons. Approximately 200 million girls, if not more, have gone through some variation of FGM specifically in countries where this procedure is practiced. Although the practice of FGM is illegal in most countries, it is a major part of some African countries and a few Asian and Middle Eastern ones. However, it is important to note that many procedures are also being done in the U.S and other strong economy-based countries.

There is not much evidence to pinpoint when and where FGM was first developed and performed but

through anthropological research, our understanding of the practice became more prominent. According to an article on the origins and reasons for FGM, research shows that FGM predates Islam and Christianity<sup>1</sup>. After further studies, researchers were able to trace the practice of FGM back to Egypt in the fifth century BC. Throughout the west coast of the Red Sea was where they believe the geographical location of most FGM practices took place. However, other researchers purposed that there is some type of correlation between slavery and the practice of FGM. For instance, it has been theorized that numerous cases were performed across slave trade routes throughout western Africa.<sup>2</sup> The supposed reasoning behind FGM in slavery was to prevent pregnancy within the slaves and to sell them at a higher price. In 1609, dos Santos reported that a group near Mogadishu, Somalia "had a custom to sew up their females, especially young slaves to make them unable for conception which makes them sell dearer...". The perplexity of the origin and theories do add some curiosity among the truth behind what researchers and historians believe to be accurate but what is most pertinent is its relevance to today's society. While the 13<sup>th</sup> amendment abolished slavery in 1865, forms of slavery remain in today's society in regard to FGM. FGM stays relevant in third world countries like Sudan or India because of the mass belief that it is an essential part of their culture. Slavery is mentioned in this is essay because

although most of the victims grow up in the culture to think that having performed FGM on them is a rite of passage, they may acquiesce in doing so. Culture plays a pivotal aspect in your life and guides you in such a way that it chooses many of the decisions for you without regard to what you would choose to do. FGM highlights a form of modern slavery amongst young women despite the fact that they may have turned a blind eye and continued with the practice.

The details of the procedure prove to provide evidence of the many harmful health implications that have yet to be taken into consideration by the individuals performing them. Although their beliefs are validated among themselves, they lack the proper knowledge in health and surgical expertise to methodically remove any part of the body. The ramifications of FGM to an individual are permanent, including, scarring, emotional distress, and mental trauma. FGM is not acceptable, especially when U.S society have placed such emphasis on consent and having a right to our bodies. Not only are the health implications regarded as a human rights abuse, but the justifications are also gendered biased and highlight a form of extreme discrimination amongst women. There is no doubt that societies who practice FGM are in a state of patriarchy and have been for many generations. We have noted that FGM in no way benefits women physically, mentally, or politically. Politically, in the sense that, they are offered no rights to be treated in the same way that the men are and are also not given a choice. Choices are a humans most basic right; we have been told time and time that men and women were created equal, but we have seen that it is not always the case. Despite all the information provided of the negative aspects that is FGM, many individuals still advocate for the performance of the procedure. For such reasons, it becomes pivotal to examine all research that further incriminates the procedure. By examining present efforts to apprehend the practice of FGM, the most sensible solution is to educate about the dangers of FGM, thus primarily focusing on the causes, knowledge, and treatment, in order to further work on eradicating the issue.

## Methods

This research will attempt to gain insight and conclude that education and a strong advocacy for FGM prevention will further aid in eradicating the issue by examining the current knowledge of unaffected individuals and their willingness to learn more. The method for this procedure will include an incentive-based survey and an accompanying review article. Around 80-100 adult participants will be gathered from a social media platform such as, Instagram or Twitter to take an online survey. The posting will provide a brief overview of the survey as well as a link to take it. They will be attracted (it will be offered) with an incentive of possible monetary reward upon survey completion. This survey n be done online since there is no target age group, access to a wide range of people will provide a diverse response. However, in order to avoid any under-age participants, an age-based demographic question will be provided at the start of the survey.

This survey will ask 15 background questions

pertaining to basic knowledge of FGM. For instance, they may be asked from a scale of 1-10 how well they know about FGM. After answering questions about FGM, they will be asked a question about their inclination to donate or do more research. Furthermore, following those questions, they will be asked another 15 questions about human rights abuse as it pertains to FGM. Upon answering all questions regarding human rights, the same question concerning their inclination will be included a second time. The aim is to see how their views change before and after being asked about FGM as a human rights abuse.

The purpose of this survey will attempt to see if a person's knowledge on FGM and human rights will increase the likelihood of their willingness to support prevention. After collecting data, three categories will be formed; those who are neutral, those who care about the topic, and lastly those willing to advocate. Participants who changed their answers when asked a second time will also be recorded and compared to other participants who did not. It will determine if there is a correlation between their knowledge on FGM and human rights their willingness to advocate. It is important to note that advocacy in this study means to commit to doing further research, signing petitions, and donating to organizations. Once all data is collected, SPSS will be utilized in order to receive an accurate statistical analysis using a correlation coefficient.

## Results

The main objective for this survey is to measure the degree of willingness (operationally defined in methods) and the frequency to which the participants agree to further research the topics of interest. Because expectations for the results of this experiment were high, the survey was able to accumulate about 136 participants in order to, some degree, display more variety in our responses. After examining the results of this study, the survey indicated a small positive correlation between the level of education and their degree of willingness. However, not as strong as my hypothesis suggested ( $r = .328$ ). A reason for this correlation was most likely due to the fact that participants who are currently enrolled in school or have graduated with some sort of degree have the research and knowledge more readily available than those who do not attend a college. I had anticipated that participants with an education level of two years or more would display a higher rate of agreeableness to further research as their college education may have already accustomed them to proactively researching topics of interest. The reason for this predication is due to the conventional study and researching habits many students/alumni already exhibit. However, that was not entirely the case. My results showed that a higher percentage of those with an associate degree were less inclined than those who were (Figure 1). This could be due to the lack of motive to study or research areas not suited to their preferred studies or career paths.

Important confounding factors that we may need to be aware of that slightly skewed our results are the differences in age. Age is a crucial factor if you consider the number of years it may have been since they previously took a college course. Surprisingly though, more than 75%

of participants who were grouped in ages 55 or higher showed more agreeableness than those who were less inclined (Figure 2). The nature of this result was linked to those who indicated they had a professional/doctorate degree, considering all of them were grouped as 55 or higher. After further analyzing the results of each individual based on their age and knowledge, I found that an educated individual between the ages of 18-25 showed more of an inclination than a participant between the ages of 30-45 who were less or equally as educated (Figure 2). It is important to note that although an education does affect an individual's willingness to support, when female cutting is associated with a violation of human rights, participants became slightly inclined to agree. For instance, from the 68 individuals who were first not willing to support preventative measures, 11 individuals changed their responses and were later willing to support after being asked about human rights abuses associated to FGM (figure 3). This survey acts as a limited basis for where our awareness stands on the practice of FGM. Even with a higher education, knowledge on the topic was still fairly lower than anticipated.

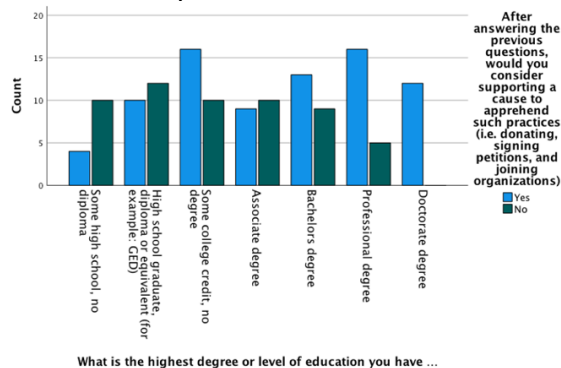


Figure 1.

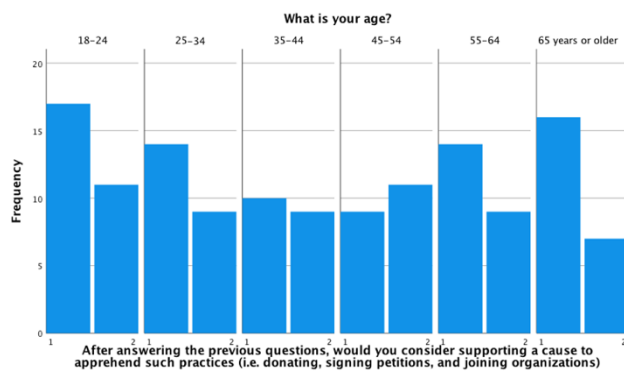


Figure 2.

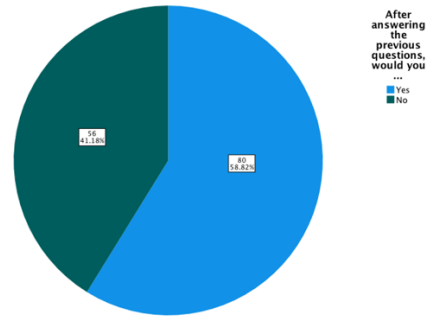
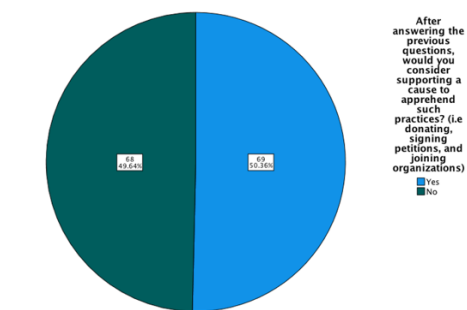


Figure 3. Before and After, respectively.

## Discussion

The anticipated results based on the research survey will represent a small but beneficial step toward recognizing and incriminating human rights abuses such as Female Genital Mutilation (FGM). Overall, the study has broadened our understanding of the ramifications of FGM as well as has given us a small overview of possible ways to continue our efforts to apprehend it. These results can be used to present a way to highlight resources and organizations that may not have been previously known by participants who took the survey. The parameters of the questionnaire included demographic-based questions pertaining to age, race, and education. These questions may not relate to FGM or human rights but ultimately critical that these questions are answered, because explanations of the survey can be led back to these variables. It is important to keep in mind the possible limitations to this study in regard to future efforts to apprehend human abuses in cultural practices. As previously mentioned, in this study we are not able to account for the number of years it has been since the participant have previously been enrolled in college course or have gained their degree. However, it will be acknowledged that proactive study habits may have declined in participants who have been out of college for seven or more years and that their response will be taken with the same importance as other participants. Furthermore, another issue to consider would be that a variety of participants would display an agreeable amount of willingness because of their ability to empathize but due to the lack of research and/or education they may not know about this topic in depth or they may not know about it at all.

Ultimately, this study has gauged the degree of knowledge to this topic and to be quite truthful, the survey has displayed that the level of knowledge is quite low. Taking this survey, might inform individuals who may not have been previously aware and motivate to gain more knowledge. The efforts to prevent any future instances have been beneficial but there is always more to done to fully do away with FGM. Understanding the research and the type of care organizations provide for refugees/apprehension of FGM may provide an in-depth insider's perspective on what happens within the culture. The most basic of human rights include a good quality of life and cultural practices like FGM portray a clear example of why it is difficult to allow each individual their right to that standard of living. Not only does it violate a quality of life but the rights to equality between genders, the right to be free of cruel and inhumane torture, and the



rights of children as well. The advocacy for FGM remains strong within the culture even with regard to a significant amount of advisement and warning, therefore our efforts need to be that much stronger. Ultimately, we have to consider that although we retain those basic rights, should we allow the rights of others to be taken away?

### **Acknowledgements**

I would like to give a huge thank you to my mentor Dr. Andrew Conteh for guiding me through this project. A special thanks to Dr. Jamila Newton for all her helpful advice and support throughout my experiment. Finally, a thank you to the honors program and honors students for their constant encouragement and support.

### **References**

- [1] Female Genital Mutilation.” *World Health Organization*, World Health Organization, 13 Feb. 2003, [www.who.int/health-topics/female-genital-mutilation#tab=tab\\_1](http://www.who.int/health-topics/female-genital-mutilation#tab=tab_1).
- [2] Khosla, R., Banerjee, J., Chou, D., Say, L., & Fried, S. T. (2017). Gender equality and human rights approaches to female genital mutilation: a review of international human rights norms and standards. *Reproductive health*, 14(1), 59.<https://doi.org/10.1186/s12978-017-0322-5>
- [3] Llamas, J. (2017) *Female circumcision: The history, the current prevalence, and the approach to a patient*. Retrieved from <https://med.virginia.edu/family-medicine/wp-content/uploads/sites/285/2017/01/Llamas-Paper.pdf>
- [4] Mackie, G, *Ending foot binding, and infibulation: a convention account*, *American Sociological Review*, 61 (6), 999-1017 (1996)
- [5] Obermeyer, C.M. (1999), *Female Genital Surgeries: The Known, the Unknown, and the Unknowable*. *Medical Anthropology Quarterly*, 13: 79-106. doi:10.1525/maq.1999.13.1.79
- [6] Universal Declaration of Human Rights.” *United Nations*, United Nations, [www.un.org/en/universal-declaration-human-rights/](http://www.un.org/en/universal-declaration-human-rights/).

# The Victorian Roots of the Graphic Novel

Colin Gage

*B.A. Candidate, Department of -Insert Major Here-, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

Received 16 April 2021; accepted 20 July 2021

---

## Abstract

Regardless of what we think of them, graphic novels have become an essential part of literature. They line bookstore shelves, reside on nightstands, and are taught in college courses. Graphic Novels have increasingly become a part of American culture. Graphic novels have a mixed heritage. On the surface, they are a recent offshoot of the comic book. This parentage can cause some people to assume that graphic novels are juvenile and therefore not worthy of the same consideration as “real” novels – novels primarily made up of words. However, upon further examination, it can be argued that graphic novels are actually part of a long literary tradition of both written and visual narrative going back at least as far as the Victorian era.

The Victorian era in English literature was known for its serialized novels. Authors would publish their works in (often bi-weekly) periodicals, sometimes literally writing each new section right before publishing it. Later on, many of these novels were published in book form. Similarly, early graphic novels were serialized in comic books – each consecutive section would be published in the next edition of the comic publication. Beside this most obvious parallel, graphic novels and Victorian novels have similarities in their timeline and visual structure, as well as their treatment of outsider characters. The purpose of this study is to answer this research question: how do the uses of timeline gaps and visual gaps, along with treatment of outsider characters, create continuing parallels between the Victorian serialized novel and the modern graphic novel?

---

## Background Section / Literature Review

The graphic novel as a form of visual narrative art has very deep roots. Visual narrative goes back millennia. Even as far back as the Roman era there were advanced forms of visual narrative. Roger Ulrich (2020) documented a form of graphic narrative – Trajan’s Column in Rome. This column is a monument to one of the most successful of the late Roman emperors. The primary feature of this column is a 200-meter-long visual narrative carved into its surface that starts at the bottom and continuously winds around the column (23 times) until it reaches the top (Ulrich, “Overview”). This column narrates the wars Rome fought with Dacia, starting with preparation for the campaign (Ulrich, “Overview”). Trajan’s Column demonstrates the continual timeline of visual narrative that is an important feature of the graphic novel.

H. Stewart Jones’s article “The Historical Interpretation of the Reliefs of Trajan’s Column” provided an overview and interpretation of the column’s artwork. According to Jones, the paper seeks “to treat the sculptures as embodying an historical narrative in stone” (Jones 435). Jones says that there are three main styles that the artist (or artists) who created the Trajan Column’s artwork used for their historical narrative: episodic, continuous, and panoramic (Jones 436-437). These styles are seen even in later visual narrative, including the graphic novel.

Although we know that visual narrative had already reached advanced stages more than 1,500 years ago, there were still more developments made that would eventually contribute to the graphic novel form. The Bayeux Tapestry, made during the middle ages to commemorate English history, made another important contribution to visual narrative. Beige (2017) pointed out that this tapestry has an important feature – it uses trees as visual breaks in the narrative, which is perhaps one of the earliest versions of framing, a feature that is prominent in

cartoons, and, later, graphic novels. Wilson (1985) provided a complete color reprinting of the Bayeux Tapestry, along with historical and artistic analysis of the artifact.

While we see in the Anglo-American graphic novel elements developed during both the late Roman era and the middle ages, it wasn’t until the twentieth century that the graphic novel itself emerged. Camus (2015) recorded the first time that the term “graphic novel” was used – in 1964 (p. 308). It was not until the 1980s that the graphic novel started emerging as a genre of its own (Camus 308). Camus pointed out that there is an acknowledged difference between comics and graphic novels; Neil Gaiman, author of the famed Sandman graphic novels, once recounted the huge increase in respect he received from an editor when the editor realized that he was not just a comic writer, but that he wrote graphic novels (309). However, although this difference is acknowledged, it is often not understood because it has not been standardized.

One of the primary differences between a comic and a graphic novel is that “structural unity seems to be the staple feature” of the graphic novel (310). Beyond this, there are several features that distinguish the two genres. One of these is the presence of time. In comics, time is either non-existent or open-ended; in the graphic novel, there is a clear beginning, middle, and ending (311). On the other hand, there are scholars who say that there are no appreciable differences between graphic novels and comics. Gordon (2010) argued that attempts to separate the graphic novel from the comic book are only an attempt to give it “some respectability” (Gordon 185). He argued that the graphic novel genre is a farce, and he used two angles of reasoning. It is a “marketing tool to help book producers sell their wares in bookshops rather than on newsstands,” (185) and also the term “graphic novel” is used with comic versions of biographies and histories,

which clearly don't fall under the traditional definition of a "novel." However, even in the cases of histories and biographies, these "comic books" are still following a sustained narrative arc and have a plot (even if it is a historical one), which seems to be something altogether different than a simple comic book.

Another thing that differentiates the graphic novel from the comic genre it apparently emerged from is the subject matter covered; graphic novels often include more mature themes than cartoon books (316). For example, Art Spiegelman's *Maus* deals with the Nazi holocaust. In fact, the existence of more mature themes is one of the more prominent features of the graphic novels. Halsall (2015) gave Alan Moore's works as an example of the broader scope of the graphic novel over the comic book. In both of Moore's graphic novels, *The League of Extraordinary Gentlemen* and *Lost Girls*, he explores the themes of "sexuality, heroism, identity, and Empire" (Halsell 253). One of the most prominent aspects of the Victorian era was the idea of empire – the British Empire literally encircled the globe. These graphic novels reinterpret the glorified nationalism and industrial might of the Victorian era. *The League of Extraordinary Gentlemen* instead creates a backdrop of crumbling industrial dreams and pollution – even cruelty (253). Closely tied to this idea of empire is the idea of heroism. Great Britain's empire was built on the backs of slaves, forged through chaos. Its heroes were its military, who committed the crimes of its rulers. *The League of Extraordinary Gentlemen* explores a convoluted idea of what makes a hero. The characters in this league are all allied with the British government to protect the commonwealth – even when it is oppressive to other nations and "outsider" groups. (255). Ironically, the gentlemen in this league are all sorts of outsiders themselves, "marginalized for one reason or another by society" (253).

As Halsell pointed out, *The League of Extraordinary Gentlemen* also deals with the theme of identity. It does so on multiple levels. The characters, as social outcasts and sometimes villains, (255-256) show the dual nature of the British empire – its heroes are villainous, and even more villainous is the empire that would use its outcasts to protect itself from its enemies. Further, its characters all have borrowed identities. The league is made up of characters from famous Victorian-era books, such as Captain Nemo from *20,000 Leagues Under the Sea*, and Doctor Jekyll and Mr. Hyde from Robert Louis Stevenson's book of the same name. (256-257). As Vandermeersche and Soetart (2015) pointed out, this keeps with a well-established trend that both adopts and adapts characters from "higher" literary sources to fit into new narratives (4). This work both continues and critiques the Victorian era. During this era, writers such as Charles Dickens wrote books to point out the hypocrisies and abuses of then-current-day British society. *The League of Extraordinary Gentlemen* continues this trend by critiquing the Victorian era (and by extension the modern one) by pointing out its abuses of the outsiders and the marginalized. It also modifies the critique by adapting Victorian characters and sometimes stripping them of their perceived Victorian veneer of innocence.

From a historical perspective, it seems that graphic novels are generally designed for a more mature readership. Alverson (2016), however, pointed out that there has been an increasing share of the graphic novel market going to children's graphic novels. She gave the example of Papercutz, a publishing house that was founded on exclusively publishing graphic novels for children. Because of Papercutz's pioneering, "almost every publisher now has either bulked up their kids' line or is offering stuff that 10 years ago they would never have considered being part of their comics mix" (Alverson 1). So, although the graphic novel has traditionally been the "grown-up" version of comics, the trend may be changing. However, these graphic novels still would have narrative structure, and many of them are based on older, already-published classic books, which still fits the overall structural argument for graphic novels.

From the start, there is already a strong parallel between Victorian serialized novels and Anglo-American graphic novels – both genres are built on narrative gaps. O'Sullivan first argued that serialized narrative is more like poetry than traditional narrative because of the "creation of meaningful sequence by the negotiation of gap" ("O'Sullivan 50). According to the author, the six elements of standard serialized narratology are: iteration, multiplicity, momentum, world-building, personnel, and design" (50). Serial elements "cut across" traditional elements of narrative (51). Iteration is a recognizably repeatable element within the narrative ("iterative thresholds") (52). Multiplicity is an element of serialized novels that intentionally moves the narrative to a different location or has multiple narrative threads. This makes the serialized narrative interesting, but also difficult to resolve in the end (54-55). Momentum is the element that keeps the reader/viewer wanting to watch the next installment (often using cliffhangers) (55). World-building has to do with creating an imaginary physical environment for the narrative (the concept of time is also closely interwoven) (57) "Personnel" is usually considered "characters," but the interaction / point of view / introduction / subtraction of "personnel" makes this category more complex (58-59). "Design" has to do with a general awareness of how an author creates and follows a standardized pacing in his or her work (59).

Using these sources, I analyzed *Maus*, *The League of Extraordinary Gentlemen*, *Oliver Twist*, and *Hard Times* to answer these questions: how do the uses of timeline and visual gaps, along with treatment of outsider characters, create continuing parallels between the Victorian serialized novel and the modern graphic novel?

## **Method**

### *Materials or Apparatus*

Both primary and secondary sources were used to conduct research. Research databases (such as CSU OneSearch, MLA International Bibliography Database, JSTOR, Johns Hopkins Guide to Literary Theory, and Worldcat) were used to gather background information on the roots of graphic narrative, establishing both the content and the structure of the narratives depicted in each piece of work. Charles Dickens' *Oliver Twist* and *Hard Times*

were used as the two examples of Victorian serialized novels. Art Spiegelman's *Maus I: My Father Bleeds History*, *Maus II: And Here my Troubles Began* and Alan Moore's *The League of Extraordinary Gentlemen* were used as primary sources for the graphic novels.

### *Procedure*

Research focused on two specific frames of analysis. First, the research focused on the presence of gaps within the narratives. Serialized novels generally had specific time gaps between when each installment came out to the reading public. By using source materials, the narratives were broken down into their originally published pieces (often by chapters or groups of chapters) so that the representation and the significance of the time gap could be analyzed. For each gap, a few key elements were analyzed and taken into consideration: 1) how much time took place between when each piece of the story was actually published, 2) whether there was a corresponding time narrative gap within the story (and how much time passed), 3) if there was not a time gap in the story, what changed to signify a breaking off point, and 4) what visual elements helped signal each distinct part of the serialized novel. Additionally, this study picked one keystone character from each novel to analyze their outsider status within the story. For *Oliver Twist*, the chosen character was, of course, Oliver. For *Hard Times*, the character was Sissy Jupe. For *Maus*, the character was Vladek Spiegelman. For *The League of Extraordinary Gentlemen*, the character was Miss Murray. Each character was assessed based upon how they were separated from general society, how they were separated from their peers, and whether they were considered a hero in the overall narrative.

### *Design*

This study was non-experimental. It was a qualitative design, constructing a framework for defining a graphic novel and establishing parallels in structure, content, and purpose among all of the literary and artistic cultural artifacts to be examined.

### **Results**

From a publication standpoint, the Anglo-American graphic novels and Victorian novels being discussed are obviously parallel. Each of them was printed in separate installments. Charles Dickens' *Oliver Twist* was printed in one-month intervals (with a few notable exceptions). *The League of Extraordinary Gentlemen* was also printed in monthly installments. *Hard Times* had the shortest publication schedule – installments came out every week. Art Spiegelman's *Maus I* and *Maus II* had the biggest publication gap – each section was published on average every one-to-three years, based on the copyright information in each book. Additionally, each novel was originally printed in some other form. *Oliver Twist* was first published in the magazine Bentley's *Miscellany*, according to the intro to the book; *Hard Times* was first published in *Household Words*, also according to the intro; *Maus* was originally published in *Raw*; and *The League of Extraordinary Gentlemen* was originally published in individual magazines, according to the copyright page. All

of these were later published as complete novels, as the sources page attests, and as the use of these complete novels as primary sources also attests. So, from the publication perspective, there are clearly strong parallels between Victorian novels and graphic novels.

There are also structural parallels. Each genre used some form of visual marker to break up the narrative. In *Oliver Twist*, each installment had a single illustration within it (see Appendix A). In *The League of Extraordinary Gentlemen*, each installment generally ended with a full-page frame, and each installment also generally began with a full-page frame. In *Maus*, each chapter title was given its own page, with one frame of artwork illustrating the title. In general, then, each structural break was marked by a visual break. There were, however, some variations to this rule. *Hard Times* did not have any illustrations, so the only visual breaks that it contained were the chapter headings and the book headings (it was divided into three "books," or sections).

Probably the most unexpected result of this study came when the narrative gaps between installments were analyzed. While O'Sullivan gave the opinion that serialized novels would naturally gravitate toward "cliffhangers," I did not find this to be the case. Additionally, I had originally expected to see time gaps in the narrative for every time there was a time gap in the writing. I also did not find this to be true. While I did find there were some striking time gaps, especially in the Victorian novels, I found that many of the time gaps were either too ambiguous to quantify, or that there was a continuous narrative flowing over the gap. Art Spiegelman's *Maus* novels were the most interesting. They had a combination of stop-and-go time (within the meta-narrative of the author interviewing Vladek where he would arrive, interview, and leave), along with a continuously flowing narrative of Vladek's wartime experiences. Overall, it seems that there was actually more continuous action in both the Victorian novels and the graphic novels than narrative leaps. However, since there were more leaps in the Victorian novels, this parallel is not quite as strong as the publication one.

Lastly, there were definite parallels between each novel's focus on the treatment of outsiders. In each of these novels, the main characters are, fact, outsiders. (See Appendix B) They are outsiders from their peers and their societies. As can be seen, the factors that keep them apart are, often, their race, or their sex, or their economic status. They all suffered abuse at the hands of their surrounding societies; this shows a clear critique of social ills, something that the examples from both genres share. Additionally, each character is considered a hero within their respective narratives. Miss Murray, the main character in *The League of Extraordinary Gentlemen*, is portrayed as the narrative's hero – it starts with her, she brings everyone together, and it ends with her. Sissy Jupe, in *Hard Times*, is also a hero. She is the one who resists the forces of pragmatism and brings hope to everyone in the end. *Oliver Twist*, likewise, is the hero for overcoming his difficult childhood circumstances. Vladek Spiegelman in *Maus* is a hero for overcoming the holocaust. However, the genres (or at least these examples of the genres)

diverge in their depictions of the hero's character. In *Oliver Twist* and *Hard Times*, each character seems to possess a native goodness that cannot be tainted by any circumstance – their overcoming almost seems inevitable. In *Maus* and *Extraordinary Gentlemen*, the characters are less angelic. Vladek is stuck in the past and a bit abusive to his second wife. Miss Murray commits fornication with one of the members of the league. So, although each novel has an outsider for a main character, the depiction of their character is quite different.

These small differences, however, between the genres, do not seem to be enough to make a counterclaim that the two genres are wholly unconnected. Although the primary means of communication have changed from the written word to the picture, and although the characterization of heroes has changed as well, it is still notable that there are several strong parallels between the two novels. Based on the parallels of publication and structure, this study concludes that the Anglo-American graphic novel is a literary successor of the Victorian serialized novel.

## Discussion

Grubb (1941) and Paroissien (2008), along with internet archived copies of original serial publications, helps frame the timeline of the gap analysis. Each of the examined texts has a balance of words and graphics. The Victorian serialized novel had a text-heavy balance, which for some time has been the traditional approach in literature. Per Lefevre, the predominance of text over illustration seems to have started with Gutenberg's invention of the printing press (Lefevre 43). The unadorned page of text has come to symbolize what is "adult," and what is serious and worth considering (even though many texts before this period were illustrated with woodcuts, etc.) (40-43). "Even today . . . neutral, unmarked typography is still characteristic for the bulk of both digital and printing work that aims to look serious, while the marked text has become typical for advertising and illustrated magazines" (43). Including visual elements can actually provide a more stimulating reading/absorption experience and introduce new ways for authors and illustrators to connect with their readers. The rise of graphic novels seems to signal a swing back toward a more visually- instead of textually-oriented literary culture. This research project adds value to my field in several areas. One of the most important things it does is foster cross-pollination between several fields of study. Trajan's Column and the Bayeux Tapestry bring history, architecture, and art history into the discussion, which both shows the interconnected web of culture, and provides another framework to examine both the Victorian novel, and the graphic novel.

Additionally, this project could help to bridge a perceived divide between different genres. Because of their apparent relatively recent emergence from the comic book genre, graphic novels are sometimes denigrated as second-rate reading material because some may view graphic novels as either too juvenile or too obscene. By establishing the strong parallels between the Victorian novel and Anglo-American graphic novels, it is possible to

see that there is a logical continuity of subject matter, artistic method, and narrative structure. This may perhaps help intrigue those who would otherwise not have experienced the genre.

For those who already read graphic novels but mostly stay away from longer, older, more sparsely illustrated books, this project may have a similar affect. Many of the narrative conventions, many of the visual conventions, and some of the characters of Anglo-American graphic novels are borrowed from Victorian-era literature. By showing these readers the deep roots of this genre, this project could perhaps spark an interest to dig further into previously untouched material.

As with every research project, this is only a jumping-off point for more research. This research has had several limitations. Firstly, the sample size of novels could have been greater. Charles Dickens, although certainly representative of his time, was not the only Victorian novelist (nor were *Oliver Twist* and *Hard Times* his only books). Alan Moore and Art Spiegelman, although certainly some of the earlier and more famous Anglo-American graphic novelists, are not completely representative of the genre either.

Additionally, it was difficult given the scope of the study to integrate all of the secondary source material into the study once it actually got under way. Because of this, there is somewhat of a disconnect between my literature review / background section and the actual meat of the study than I would wish. Further research may be able to bring together some of the looser strands into a more coherent (and lengthier) whole.

Despite these drawbacks, I think that it is safe to conclude that there are definite parallels between the Anglo-American graphic novel genre and the Victorian serialized novel, and that there is more room for study in this area.

## References

- [1] Alverson, B. (2016). *Papercutz: The House Built By Graphic Novels for Kids*. Publishers Weekly, 263(26), 8–9.
- [2] Camus, C. (2015). Neil Gaiman's sandman as a gateway from comic books to graphic novels. *Studies in the Novel* 47(3), 308-318. Doi:10.1353/sdn.2015.0038
- [3] Halsall, A. (2015). "A parade of curiosities": Alan Moore's *The league of extraordinary gentlemen* and *lost girls* as neo-victorian pastiches. *Journal of Popular Culture*, 48(2), 252-268.
- [4] Jones, H. (1910). *The Historical Interpretation of the Reliefs of Trajan's Column*. *Papers of the British School at Rome*, 5(7), 435-459. Retrieved May 18, 2020, from [www.jstor.org/stable/40310297](http://www.jstor.org/stable/40310297)
- [5] Dickens, C. (1991). *Oliver Twist*. The Oxford Illustrated Dickens. Oxford. Oxford University Press.

- [6] Dickens, C. (1991). *Hard Times*. The Oxford Illustrated Dickens. Oxford. Oxford University Press.
- [7] Dickens, C, Ed. (1854). *Household Words*, Volume IX. The University of Buckingham. Dickens Journal Online.  
<https://www.djo.org.uk/household-words/volume-ix/page-170.html>
- [8] Dickens, C, Ed. (1837). *Bentley's Miscellany*. Internet Archive.  
<https://archive.org/details/bentleymiscell07unkngoo/page/n133/mode/2up?q=Oliver+Twist>
- [9] Gordon, I. (2010). Let Us Not Call Them Graphic Novels. *Radical History Review*, 106, 185–192.  
<https://doi-org.libproxy.csustan.edu/10.1215/01636545-2009-027>
- [10] Grubb, G. (1941). On the Serial Publication of *Oliver Twist*. *Modern Language Notes*, 56(4), 290-294.  
doi:10.2307/2910445
- [11] Lefèvre, P. (2010). Intertwining verbal and visual elements in printed narratives for adults. *Studies in Comics*, 1(1), 35–52.  
<https://doi.org/10.1386/stic.1.1.35/1>
- [12] Moore, A., & O'Neill, K. (2013). *The League of Extraordinary Gentlemen*, the omnibus edition. New York: DC Comics.
- [13] O'Sullivan, S. (2019). Six Elements of Serial Narrative. *Narrative*, 27(1), 49–64. <https://doi-org.libproxy.csustan.edu/10Si.1353/nar.2019.0003>
- [14] Paroissien, D. (Ed.). (2008). *A companion to Charles Dickens*. ProQuest Ebook Central  
<https://ebookcentral.proquest.com>
- [15] Spiegelman, A. (1986). *Maus: A survivor's tale*. New York: Pantheon Books.
- [16] Vandermeersche, G and Soetaert, R. (2011) "Intermediality as Cultural Literacy and Teaching the Graphic Novel." *CLCWeb: Comparative Literature and Culture* 13.3 (2011):  
<https://doi.org/10.7771/1481-4374.1806>
- [17] Wilson, D. (1985). *The Bayeux tapestry: The complete tapestry in color* (First American ed.). New York: A.A. Knopf.

Appendix A: Narrative Gaps

| Narrative Gaps Analysis Criteria and Summary            |                        |   |  |   |
|---|------------------------|---|--|---|
| Novels and Average Length of Time Between Installments  | Number of Installments | Average Number of Chapters Between Gaps | Presence of Extra Visual Means of Marking Serialization Gaps | Narrative Gap: Obvious Time/Location Break  |
| <i>Hard Times</i><br>1 Week                             | 20                     | 3                                       | No   | <i>Hard Times</i> : ½ of the time narrative break at serialization break is uncertain. Approx. 1/3 of the time, continuous action. Approximately 6/10 of the time location change |
| <i>Oliver Twist</i><br>1 Month                          | 23                     | 2                                       | Yes  | Approximately 1/5 of the time narrative break at serialization break is uncertain. Approximately ¼ of the time continuous action. Approximately ½ of the time location change.    |
| <i>The League of Extraordinary Gentlemen</i><br>Unknown | 6                      | 1                                       | Yes  | Continuous action at all gaps except between Book I and Book II.  |
| <i>Maus I and Maus II</i><br>2 Years                    | 6 and 5, respectively  | 1                                       | Yes  | Frame Story always has location and time changes (general gap is a few months). Narrative has continuous narrative throughout.  |

Appendix B: Outsider Characters

| Outsider Characters   |   |   |   |
|---|---|---|---|
| Character Name  | What Made Them Outsider from General Society  | What Made Them Outsider from Peers  | Hero or Villain?  |
| <b>Miss Murray</b> (from <i>The League of Extraordinary Gentlemen</i> ) | She was divorced (Part 1, Book 1)<br>She was a rape survivor (Part 1, Book 1)<br>She had scars on her neck, so she wore a scarf (Part 2, Book 4)                    | She was a woman (all the rest were “gentlemen”)<br>She was the one who brought them all together.<br>She was the least violent / showed the most compassion (see part 2, Book 6, where she says she wouldn’t want “any creature suffering unnecessarily”<br>She doesn’t kill anyone | Hero.<br>Was the most compassionate, saved lives on occasion.<br>Not a Victorian hero (fornicator in Part 2, Book 4)<br>Story starts and ends with her (she survives) |
| <b>Vladek Spiegelman</b> (from <i>Maus I and Maus II</i> )              | At first, not an outsider.<br>Hard-working member of society, ended up owning a factory, fighting in the war.<br>After Germans took over: outsider because of race. | Past: he was more resourceful than many of his friends, able to survive better, sometimes had special privileges with camp guards.<br>Present: he had lived through the Holocaust, so he had a different perspective than most people.  | Past: hero. Survived the holocaust.<br><br>Present: mixed bag. Hard to deal with, slightly abusive to his present wife.   |

|   |   |   |   |
|---|---|---|---|
| <p><b>Sissy Jupe</b> (from <i>Hard Times</i>)</p>                           | <p>Father was a circus actor – not “normal”<br/>She’s an idealist in a society completely dominated by pragmatism</p> | <p>She can’t seem to conform to the strictly utilitarian teaching methods.<br/>She becomes essentially orphaned</p>   | <p>Hero.<br/>Victorian ideal. Wins everyone over, helps change people’s minds, make things better in the end.</p> |
| <p><b>Oliver Twist</b> (From, surprisingly enough, <i>Oliver Twist</i>)</p> | <p>He was an orphan, raised in a workhouse.<br/>He was poor</p>   | <p>With Fagin’s robber band, his incorruptible nature made him an outsider.<br/>With Brownlow and the “good” people, his young age and the danger posed by his former associates makes him an outsider.</p> | <p>Hero.<br/>Overcomes his situation.<br/>Seems incorruptible by nature (Victorian ideal).</p>                    |



# Speculation on the Future of Moore's Law and Analysis of Business Proceedings Within the Microprocessor Industry

Abram Galvez

*B.S. Candidate, Department of Business Administration / B.S. Candidate, Department of Computer Science, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

Received 14 May 2021; accepted 20 July 2021

## Abstract

Understanding the future of Moore's Law is critical for research on microprocessors but also for businesses who pour investment into research and development of these microprocessors, which I believed to positively correlate with Moore's Law's continuance. Moore's Law, an observation on microprocessor development, states that the density of components within microprocessors doubles roughly every two years. Increasing the density is accomplished by shrinking the components of the microprocessor. While this process continues to make headway, shrinking will come to a halt and with it, the end of Moore's Law. Investigating previous slowdowns to Moore's Law, such as Dennard scaling, and research solutions to the unstable viability of silicon, the proximity of Moore's Law's end does not seem to be near. Furthermore, the correlation between business investment and Moore's Law's continuance is limited due to additional factors that serve to determine viability of investment. This conclusion is furthered by the introduction of the more than Moore idea, where microprocessor development can continue in varied physical device implementations as well as software development. The eventual end of Moore's Law requires, within the business lens, a speculation on where investment will shift, which I believe will be towards expanding the current implementation of more than Moore.

*Keywords: microprocessor, Moore's Law, More than Moore, semiconductor, transistor, investment*

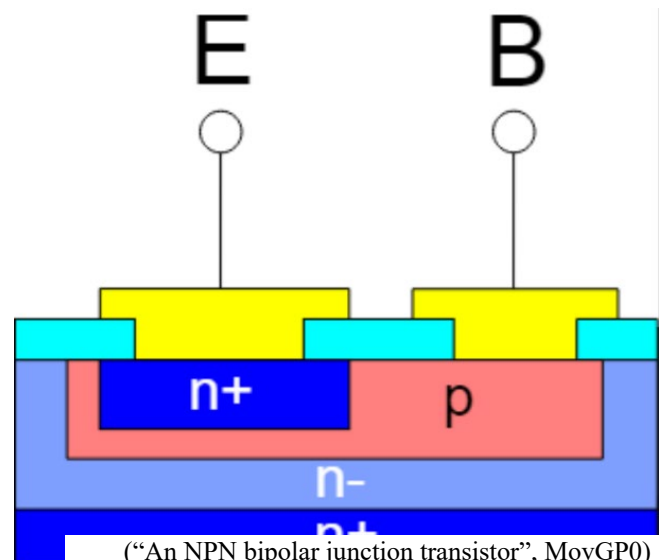
## Introduction

The intent of this research is to determine the current state of Moore's Law and using that determination in conjunction with the microprocessor industry growth rate, deduce a correlation between Moore's Law and business investment. Through this determination, provide some advice to potential businesspeople on investing within the microprocessor industry. This journey began with Gordon E. Moore, co-founder of the multinational company Intel, and his observation in 1965. His observation has charted the course for the computer industry for decades. This observation states that the density of components within a microprocessor will double around every two years. Doubling the density of the components comes hand in hand with an increase in performance.

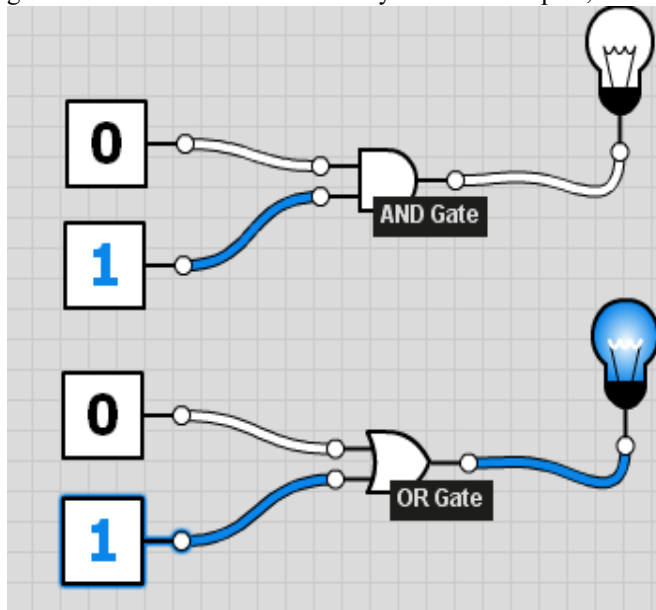
To understand the increase in performance, prerequisite knowledge of electrons and their roles in the various components is required, the most prominent being the transistor. In an atom, there are three parts, two that are part of the atom's center, the nucleus, and one that circles the nucleus. Protons and neutrons make up the center of the nucleus, and specifically the number of protons determine the actual characteristics of the atom. This research relies more on the electron, and specifically the electron's ability to transfer between atoms. Electrons do not possess this determining trait, instead they possess two key traits. First, electrons are tiny, even compared to a proton and a neutron, tiny. Secondly, they hold the opposite charge of a proton, a negative charge. This charge is key since the nature of physics states that opposite charges attract. Without delving too deep into the electromagnetic branch of physics, what is necessary to

take away is this charged relationship between atomic particles (electrons and protons). This attraction enables electric flow, as electricity is just the movement of charged particles, like electrons, and all that is required is the correct tool or technique to pull the electron away from the atom.

Transistors are the computer science construct that drives the industry forward. A transistor is a semiconductor with three connections. A semiconductor is an element, or material that has conductive properties opposite of metal, in that its electrical conductivity increases as its temperature decreases. Additionally, semiconductors are good insulators, not as great as rubber, but good enough. Notably, silicon is used for electronic circuits.



(Semiconductor, 2014) Transistors can transmit electrical current or amplify electrical current, depicted below. The transistor acts as a switch, containing three large regions. Two ends of the transistor have a negative charge and are typically called the source and the drain. Between these two ends is a large positive region that separates them. Additionally, there is an electrical gate on top of the transistor as well. Activating the gate, applying a small positive charge enables electrons to move from the source to the drain, acting as a switch. When the gate is not active, electrons cannot flow as the charged regions are separated by a layer of repulsive, similarly charged, particles. Within computers, transistors are used to form logic gates, allowing for multiple inputs of electrical current. Depending on whether it receives both currents, one current, or no current, will change the output to either transmit a current or not. This allows for the logic conclusion of AND or OR. (Transistor, 2014) If the transistor is constructed so as to only let electric current pass if both inputs are activated, then the transistor is an AND gate, since arbitrary input A and arbitrary input B must have electrical currents. OR gates work much the same, however only one of the arbitrary inputs needs to have an electrical current to pass through the gate. There can also be an arbitrary number of inputs,

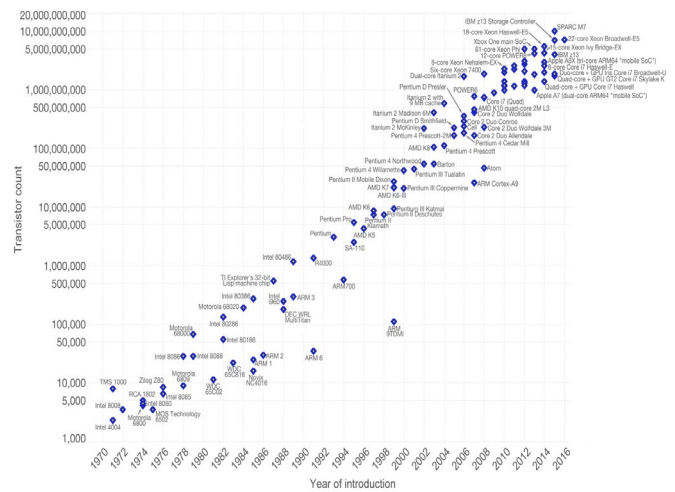


(“Logic Gates”, Babbage321)

but they must adhere to the same requirements for both gates, having A and B and C and n, etc., active in order to satisfy the AND gate, applying to the OR gate in a similar fashion. Transistors enable logic gates, which in turn enable the computer to manipulate data by holding charge, and relating charge to either a one or a zero, true or false. Below is a depiction of both the AND and OR gates, where the blue indicates an electric current.

This observation, Moore’s Law, has laid the

groundwork for the technology industry and has been an incentive, driving research and business forward. Specifically, the semiconductor industry, the industry involved with the development of semiconductors, is fundamentally affected by the looming schedule of Moore’s Law. Manufacturers and software developers have relied on this observation since, using it to pour resources into crafting better and better software to utilize the increase in microprocessor performance as well as plan ahead products for distribution. This driving force has allowed the progression from rudimentary computers in 1965, to the relatively swift computers that existed in the 1990s. Thanks to the development of the internet, the quick computers have increased further in their capabilities to become the highly sophisticated, intricate, and versatile machines that we have come to know today in our phones, cars, laptops, and desktops. Moore’s Law may be in danger,



(“Moore’s Law Transistor Count 1971-2016”, Max Roser)

as the Law has held up according to schedule, however recent articles and journal entries have a doubtful stance regarding its future veracity. These recent works expect the microprocessor industry will encounter a decrease in year-to-year performance gains or a wall in advancement. This particular wall may be new, but the advancement of Moore’s Law has run into problems before. (“Gordon E. Moore”, 2017) Depicted below is a timeline of prominent microprocessors, the date they were released and their corresponding transistor count. Ordinarily Moore’s Law would require an exponential graph, however the y-axis scales to allow for a linear representation.

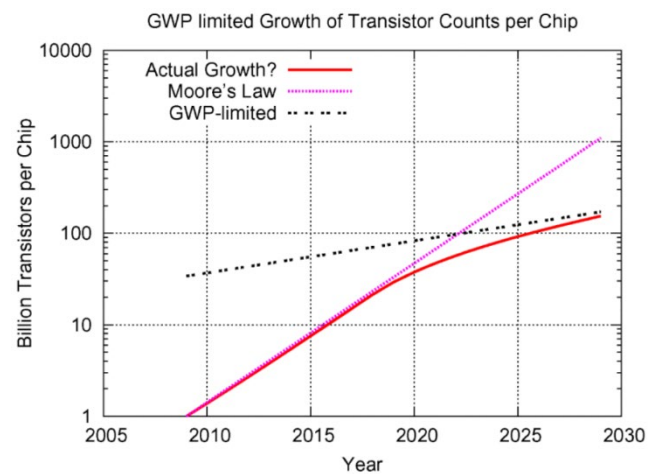
There have been obstacles before that have provided doubt to Moore’s Law’s veracity. One obstacle was the mobility of electrons as transistors grew smaller and smaller. This became a major problem as microprocessor chips began to decrease in performance. To combat this, researchers introduced strained silicon, getting microprocessors back on track

for continued performance gains. (Hoyt et al, 2002) Another obstacle that we continuously battle is the amount of waste heat from the microprocessor. In the early days of microprocessor development, the heat generated from increasing the number of transistors was calculated to remain the same by ensuring that the power consumed remained the same. This calculation was about maintaining a ratio between area and power use, created by Robert H. Dennard and as such is named Dennard scaling. (Bohr, 2007, 11-13) Heat generated by moving electrons within the microprocessor has limited the speed at which calculations are performed by the microprocessor. There have been incremental improvements to reduce the power consumption and consequently the heat generated by the microprocessors, allowing for longer battery life of mobile devices. The increased density of transistors allows for a reduction in required distance travelled for electrons, which means less movement, ending in less heat generated. Increasing density of transistors allows for increased performance, but that performance is itself being limited by physical limitations, first by heat generated, now by size. ("There's more to come from Moore: Moore's Law Is Approaching Physical Limits: Truly Novel Physics Will Be Needed to Extend It.", 1-11) Beginning in 2006, heat escaping due to the semiconductor unable to contain the entirety of the electrical current and resulting in the heating of the chip. Increased environmental heat generation leads to an unsustainable power requirement in order to maintain performance scaling, thus marking the end of Dennard scaling. The current state of transistors may allow for continued reduction "down to a size of perhaps 5 nanometers. But further improvements in performance will require fundamentally new physics." ("There's more to come from Moore: Moore's Law Is Approaching Physical Limits: Truly Novel Physics Will Be Needed to Extend It.", 9) Not all problems exist within the physical realm, some extend beyond to more abstract concepts.

There may be a second obstacle of large concern as well. Moore's Second Law states that while the price-to-performance of microprocessors will decrease, the cost for producers will increase. Producers have to pay for the new fabrication houses, the installation of new machines for more complex microprocessor designs, and the increasingly expensive research required to allow for transistor shrinking. There exists a relation between the growth of the semiconductor industry and the growth of the GWP (Gross World Product). The relation indicates that the growth of the semiconductor industry grows at a rate faster than the GWP. As depicted in the graph below, the projected actual growth of the industry is set to slow down just before the year 2020. Consequently, Moore's Law will be limited economically causing an external

slowdown. Thus, to allow for the continued advancement of semiconductors and transistors within microprocessors, either the semiconductor industry will take a larger and larger amount of the GWP, or there will have to be a dramatic reduction in cost associated with developing semiconductors and transistors. If not, there may be a second obstacle in the way of Moore's Law continuing to hold veracity, an economic limit. Fortunately, the data in

figures 1 and 2 in appendix A reveal continued growth, depicted in both total industry value and the CAGR (Compounded Annual Growth Rate). Most recently, the total industry worth has grown at a rate of 2.63% from 2017 to 2018. This rate increases further in the year 2018 to 2019 at 4.10%, and even further from the

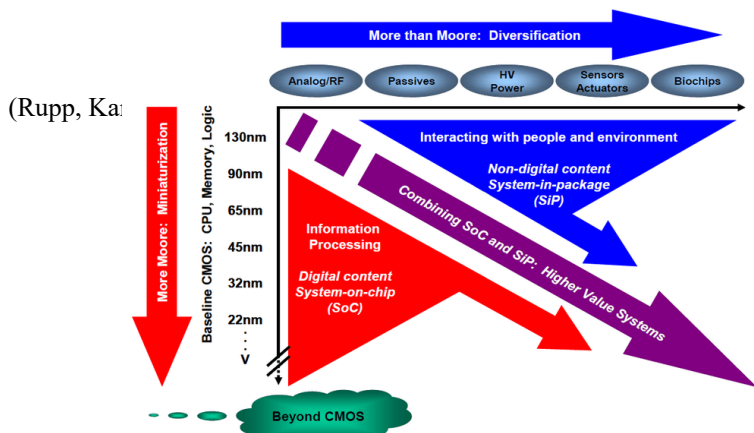


first financial quarter of 2019 to the first financial quarter of 2020 at 7.3%. (Markets, 2020) (Microprocessor and GPU Market Research Report, 2020) (Microprocessor Market Size Worth, 2020) These numbers tell a very different story than the predicted economic limit of 2010. If the GWP is increasing at the same rate as 2010, then the semiconductor industry is taking a larger percentage of the GWP, when compared to the data from 2010. The economic barrier may be as dangerous as Rupp and Selberherr claim, however the physical limitation of Silicon remains. Thanks to recent studies and perspectives, some approaches have been published for how to continue advancement within the industry and technological field. (Rupp, Karl, & Selberherr, Siegfried, 2011, 1-4)

In 2002 many researchers, knowing the limitations of silicon, began to seek the development of a new semiconductor. The results of this search are carbon nanotubes, far better semiconductors, capable of sustaining more heat for a longer period of time while also being highly conductive. Carbon nanotubes are a combination of engineering in physics and chemistry. Carbon bonds are strong, based on covalent bonds, and when formed in tubes allow for the flow of electricity.

Additionally, carbon tubes hold together at high temperatures, a critical task for a microprocessor. The main issue, as of 2002, appears to be finding a way to grow carbon nanotubes that has limited overhead in terms of time and money to form. At the time, IBM researchers found that they could accumulate viable carbon nanotubes yield faster if they burned up the non-conducting tubes through progressively more intense conductivity tests. Another method in speeding up yield requires the use of the oxidizing process. In order to develop conductive carbon nanotubes, manufacturing companies diluted the tubes with some metal to maintain the tubes' rigidity. Metal adheres to the science of oxidation which allows carbon diluted nanotubes to be vulnerable to oxygen plasma, removing the metal from the nanotubes. (Patch & Smalley, 2001) Replacing the core material is one way to increase microprocessor longevity and therefore its performance, however there are other perspectives to consider.

There are a number of different approaches to pushing microprocessor performance. The first idea is something referred to as More than Moore. This approach lets the software and varied forms of



(Arden *et al*, 2010)

implementation drive the industry rather than Moore's Law, letting the computer programmers and their capabilities be the driving force for what the semiconductor industry should plan for. The idea is to look at what are current uses for microprocessors within the world and predict what needs will develop from these use-cases, and plan around those predictions rather than Moore's Law. This will fall in line with an observation made by computer scientist Daniel Reed, "Think about what happened to airplanes, a Boeing 787 doesn't go any faster than a 707 did in the 1950s - but they are different airplanes. Innovation will absolutely continue - but it will be more nuanced and complicated." (Waldrop, 2016, 145) A graph of how More than Moore relates to Moore's Law is shown below, revealing the possible varied implementations

of microprocessors as Moore's Law continues. Strictly speaking of speed, microprocessors may stop becoming faster, but they may continue to increase in functionality, allowing for more complicated processing. (Waldrop, 2016, 144-146)

Another, more recent approach, is for the hopeful development of 2D semiconductors. These semiconductors will quite literally be one layer of atoms thick, allowing for electrons to maneuver through them with less fear of scattering due to weak electromagnetic hold. The problem with developing semiconductors this small, is that their structure will change their properties. Manufacturing on an industrial level enough one atom thick semiconductors is proving to be a serious obstacle as well. The 2D semiconductors can either be created by growing the layers of atoms, or by peeling off layers of atoms. Either way, these are processes that need to be refined to remove any room for error and to allow for mass production. The next issue is finding the right material and determining whether it can stand the test of time (being able to hold its place within the microprocessor) or the test of efficiency. If 2D semiconductors are successfully implemented in microprocessors, they may enable the continued shrinking of microprocessors. These approaches may be fruitful, but they are very much in the experimental stage and have not been implemented yet as we still do rely on following Moore's Law using silicon. (Li, Su, Wong, & Li, 2019, 169)

Primary documents sources from the IEEE database open the gate to a whole host of studies looking into possible developments to replace silicon in semiconductors. History reveals that doubt in silicon-based semiconductors has existed for over a decade. Yet these silicon-based semiconductors dominate the market. Somehow continued development on the "moderately effective" silicon semiconductors have brought continued performance gains. (Service, R. F.,

2009) Silicon has been surviving in the semiconductor industry, however in order for Moore's Law to maintain its veracity and drive performance, there will have to be a switch to a superior semiconductor.

The doubling of components within a microprocessor has yielded steady performance gains. Moore's Law serves as a roadmap with a cadence of landmarks to reach, fortunately scientists remain steady and reach each performance landmark. Since the inception of the transistor, the core material has been silicon. While Moore's Law may be better off with a different material for its semiconductors, continued silicon use does not mean the end for performance gains and market growth. Instead, growth will continue steadily, as cadenced gain will be exhibited not by the microprocessor's raw capabilities, but by the

application in which microprocessors can be implemented. This increase in utility is set to match the ever-increasing amount of features microprocessor developers, programmers, researchers, businesspeople, and microprocessor enthusiasts, seek to develop and consequently market. These capabilities, defined as non-digital functionalities, are developed features that do not follow the same performance gain pattern, but similarly are not stopped by the same restrictions that shrinking components within a microprocessor are. In essence, while Moore's Law drives the industry forward, its end will not bring about the end to developing technology, there is more to technology's development than Moore. (Arden et al, 2010)

Increasing component density, following Moore's Law, has proven to be difficult in the past. Several obstacles have blocked our advancement, some continue to stop us, while other obstacles according to scientists, economists, and researchers, are on the horizon. Still, progress has not stopped. Even now, there are thoughts and ideas being passed around for how the industry plans on moving forward, either with a new scientific breakthrough or some work around. Moore's Law may not be able to hold its veracity for very much longer with this turn of the decade, as new physics may be required, or a completely new solution must be developed. In our current digital world, large industries have grown to depend on increasing performance to match their increasing demand. However, what drives business investment, as investors analyze an industry differently, is not dependent on microprocessor performance. Will we encounter a significant decline in the rate of microprocessor performance increases, and if so, what will the impact be for investors, and will there be a scientific breakthrough enabling further increases in component density?

## **Methods**

### *Design*

In this non-experimental study, a subjective conclusion will be drawn from a collection of primary and secondary sources dealing with the state of Moore's Law such as scientific journals, research papers, and articles by technology analysts. This conclusion will be used to reinforce a separate subjective conclusion dealing with whether there exists a correlation between increasing microprocessor performance and business investment. The variables that will serve as metrics for business analysis in this study are the global market value and the compounded annual growth rate (CAGR). The two separate conclusions must be thoroughly synthesized to determine whether businesses should invest in the microprocessor industry and what businesses should focus on to arrive at their own investment conclusions.

### *Materials*

The materials consisted of primary documents from select peer reviewed sources from the Institute of Electrical and Electronics Engineers Xplore digital library. An example from the IEEE is the Economic Limit to Moore's Law by Rupp and Selberherr. Documents were used to show the dependence level of business on Moore's Law. Peer-reviewed primary and secondary sources will provide a foundational understanding of the current and past state of Moore's Law. Primary sources aim to describe the exact science behind how microprocessor components function both separate and together. While primary sources are the preferred source of precise information and exhaustive explanations, secondary sources provide more accessible information, summarizing primary sources with less technical vocabulary.

Finally, enabling business analysis, choose a sound metric for industry trends that will matter to investors. Historical data from several online sources, such as grand view research will provide consistent data on industry worth, which will serve as the metric for this study. Consistent data will be used to provide accurate information on the changes in the microprocessor industry worth. The changes in microprocessor industry worth, this study's chosen investor metric, will be the final material required to develop a conclusion on the dependence level of Moore's Law's progression for investors.

### *Procedure*

In relation to determining the state of Moore's Law, sources were chosen in a variety of ways. First, selecting sources that provided scientific research in how Moore's Law has been made possible throughout history, providing a developmental history. Second, in selecting many articles all focused on present day innovations for progressing Moore's Law or alluding to present-day innovations. Lastly, sources chosen for establishing an understanding of Moore's Law provided background information giving meaning to the components of a microprocessor, a transistor, resistor, diode, and capacitor. (Moore, G. E., 2006) Attaining a good understanding of the development of Moore's Law helped in the prediction of where Moore's Law will lead.

Subsequently, the research required definitions and understanding from the business side as well. Finding a trusted resource is critical in creating a metric that will provide a connection to the technology industry. This study focused on a global market scale as its metric, in particular, the global microprocessor market value. This value represents the yearly direct revenue from the selling of microprocessors. The market value was coupled with the CAGR or compounded annual growth rate. The raw number of the market value represents with its billion-dollar

numbers, the weight of the microprocessor industry. The CAGR is a simpler way of looking at the growth rate for the past few years and can be used to predict the future growth. In short, the focus was finding sources that provided an accurate global market value and an up to date CAGR for the time period. Concluding the ideas put forward lies a synthesis of these seemingly disparate ideas and concepts through logic and reasoning enabling educated predictions.

The first prediction that can be made through this synthesis is whether or not Moore's Law will continue within the scope of the research, ten years. The second prediction or recommendation based on prediction is whether the global microprocessor industry is worth investment. Finally, combining these two predictions, establish a claim about the correlation, positive or negative if any, between Moore's Law's progression and microprocessor investment.

## Results

This study aimed to determine the state of Moore's Law in terms of a minimum continuance period. In addition, this study meant to use that determination to provide advice to businesspeople looking to invest in the microprocessor industry. This study began under the assumption Moore's Law would end within a few years, as numerous news articles predicted. The evidence presented in this study did not support those predictions. Instead, it suggested a continuance period of at least 10 years. This study suggested that as long as microprocessor advancement continues, either through Moore's Law or through More than Moore, businesses are expected to profitably invest in the industry. Microprocessor advancement has brought with it increased productivity and convenience, significant consumer incentives, providing further reasoning for business investment.

The focus of this research was on Moore's Law, requiring determination through analysis of related research, the proximity of Moore's Law's end. The first potential limitation with regard to Moore's Law was economic—but will not play a role in the foreseeable future according to this study. The current trend with regard to the microprocessor industry, also known as the semiconductor industry, is one of economic growth. The industry value data suggests growth will continue within the industry for at least the next ten years.

The physical limitations are more likely to prevent Moore's Law's continuance than economic limitations. Historical data revealed that Moore's Law is limited with the use of silicon. Fortunately, the time period for research on a silicon replacement starting in the early 2000's places Moore's Law in a favorable position. This study shows that silicon has been projected to be replaced by semiconductors better

suited to serve as microprocessors. This study implied silicon's replacement is well researched, such that its implementation will have minimal negative effect on the continuation of Moore's Law.

The most important developed understanding was the distinction between Moore's Law's continuance and other forms of microprocessor advancement, as it relates to investment practices. Moore's Law has been vital to increasing microprocessor performance through physical improvements. Microprocessors are not limited to physical improvements: More than Moore revealed that virtual advancement is not only possible—but thriving. Therefore, investment within the microprocessor industry is positively correlated to Moore's Law, but is also positively correlated to general advancement in microprocessors and consumer demand. As long as consumers continue to demand microprocessors, investment within the industry will yield return.

## Conclusion

In conclusion, Moore's Law has brought us far in microprocessor advancement, however the diversification of advancement into More than Moore has provided a critical new perspective to how microprocessors should be viewed. Data indicated More than Moore has a significant perpetual role in microprocessor advancement comparable to Moore's Law and may even compensate for gaps in investment incentive caused by deficiencies or lag in the way Moore's Law actually occurs

## Discussion

The idea that Moore's Law is the only metric for determining business investment proved to be false. Instead, investors make decisions based upon market trends. This study has helped to contribute a historically based interpretation of the current microprocessor direction. There is a lot of confusion around Moore's Law and if it will continue to maintain its veracity. This study makes the conclusion that Moore's Law will continue to remain true and it bases it upon history. This study's interpretation of history reveals a logic to determining why Moore's Law will continue to maintain its veracity, which removes confusion and provides additional food for thought when discussing the future of Moore's Law.

This study focuses on interpreting the work of others to synthesize a conclusion on both the state of Moore's Law and what performance metric should be used by investors. One large issue is that leading research in microprocessors is not made readily available to the public or even a student. This study would be drastically different and likely more accurate if the most up to date research was used. Instead, knowing the limitation of research accessibility, this

study used the most current and prevalent data to determine the state of Moore's Law. Using historical data, a forecast is made of the future of Moore's Law, to provide insight into what actions should be taken in the present.

Data and statistics were also limited in accessibility. Most databases that track business information lock it behind a paid access wall. This obstacle prevented information from extending over a long time period as well as limited the amount of information provided. This led to a very small scope of business data, both in terms of time period and detailed data. Specifically, the time range of data availability affected the accuracy of the graph information as only the few most recent years' data were accessible. Preferably, this study would be done to show market data over the entire lifespan of Moore's Law and include a variety of data. The timeline must include consistent data, presumably extracted from the same source.

While this study could benefit greatly from more accurate information, the foundational understanding of microprocessors developed throughout allow for the uninitiated to grasp how microprocessors function and the complexity of their design. Information detailing the function of microprocessors is a topic that is accessible to read, however the research and reports are often very technical. In short, a strength of this study is its presentation of technical information to those uninitiated into the microprocessor world. This strength is owed to accessible information, provided by accessible databases and helpful researchers.

The information and data that support this study are not up to date, but the logic and conclusions made carry forward. Businesses use forecasting logic to determine the expectations of the following year. Forecasting logic used within this study predicts the maintenance of Moore's Law, the growth of the microprocessor industry, and actions taken by investors.

## Acknowledgements

I would like to thank members of the honors capstone program for all of the constructive feedback in Dr. Newton and Dr. Gupta's class, from the professors and the students. I want to thank the honors program for encouraging research. I also want to thank the librarian Tim Held for his aid in narrowing my topic as well as Dr. Fode-Made for his computer science expertise.

## References

Angelo Zino, & Jien Loon Choong. (2019). CFRA Semiconductors & Semiconductor Equipment. *Industry Survey: Semiconductors & Semiconductor Equipment*, 1–64. "An NPN bipolar junction transistor structure" by MovGPO is

licensed under CC-BY-SA 3.0

Arden, W., Brillouët, M., Coge, P., Graef, M., Huizing, B., & Mahnkopf, R. (2010). "More-than-Moore" White Paper.

Bohr, Mark. (2007). A 30 Year Retrospective on Dennard's MOSFET Scaling Paper. IEEE Solid-State Circuits Society Newsletter, 12(1), 11–13. <https://doi.org/10.1109/N-SSC.2007.4785534>

"Gordon E. Moore." *Science History Institute*, 12 Dec. 2017, [www.sciencehistory.org/historical-profile/gordon-e-moore](http://www.sciencehistory.org/historical-profile/gordon-e-moore).

J. L. Hoyt *et al.*, "Strained silicon MOSFET technology," *Digest. International Electron Devices Meeting*, San Francisco, CA, USA, 2002, pp. 23-26, doi: 10.1109/IEDM.2002.1175770.

Li, Ming-Yang, Su, Sheng-Kai, Wong, H-S Philip, & Li, Lain-Jong. (2019). How 2D semiconductors could extend Moore's law. *Nature*, 567(7747), 169-170.

"Logic gates" by Babbage321 is licensed under CC-BY-SA 3.0  
Markets, R. (2020, October 12). Global Microprocessor and GPU Market (2020 to 2025) - Increase in Adoption of Smart Factories and Industry 4.0 Presents Opportunities. <https://www.globenewswire.com/news-release/2020/10/12/2106712/0/en/Global-Microprocessor-and-GPU-Market-2020-to-2025-Increase-in-Adoption-of-Smart-Factories-and-Industry-4-0-Presents-Opportunities.html>

McLeod, S. (2020). *Correlation Definitions, Examples & Interpretation*. <https://www.simplypsychology.org/correlation.html>.

*Microprocessor and GPU Market Research Report – Global Forecast till 2024: MRFR. Microprocessor and GPU Market Research Report – Global Forecast till 2024 | MRFR. (2020, September).* <https://www.marketresearchfuture.com/reports/microprocessor-gpu-market-7774>.

*Microprocessor Market Size, Share: Industry Report, 2020-2027.* Microprocessor Market Size, Share | Industry Report, 2020-2027. (2020, May). <https://www.grandviewresearch.com/industry-analysis/microprocessor-market>.

Microprocessor Market Size Worth \$112.87 Billion By 2027. (2020, May). <https://www.grandviewresearch.com/press-release/global-microprocessor-market>.

Moore, G. E. (2006). Lithography and the future of Moore's Law. IEEE Solid-State Circuits Society Newsletter, 11(3), 37–42. <https://doi.org/10.1109/N-SSC.2006.4785861>

"Moore's Law Transistor Count 1971-2016" by Max Roser is licensed under CC-BY-SA

Patch, K., & Smalley, E. (Eds.). (2001). Computer chips: Post-moore's-law possibilities. ProQuest Ebook Central <https://ebookcentral.proquest.com> "There's more to come from Moore: Moore's Law Is Approaching Physical Limits: Truly Novel Physics Will Be Needed to Extend It." *Nature* 520.7548 (2015): 408. Web.

Rupp, Karl, & Selberherr, Siegfried. (2011). The economic limit to Moore's law. (Report). *IEEE Transactions on*

*Semiconductor Manufacturing*, 24(1), 1-4.  
 semiconductor. (2014). In Editors of the American  
 Heritage Dictionaries (Ed.), *The American Heritage  
 Student Science Dictionary* (2nd ed.). Houghton Mifflin.  
 Credo Reference:  
<https://login.libproxy.csustan.edu/login?url=https://search.credoreference.com/content/entry/hmsciencedict/semiconductor/0?institutionId=1849>

Service, R. F. (2009). MATERIALS SCIENCE: Is Silicon's Reign Nearing Its End? *Science* (American Association for the Advancement of Science), 323(5917), 1000–1002.<https://doi.org/10.1126/science.323.5917.1000>

transistor. (2014). In Editors of the American Heritage Dictionaries (Ed.), *The American Heritage Student Science Dictionary* (2nd ed.). Houghton Mifflin. Credo Reference:  
<https://login.libproxy.csustan.edu/login?url=https://search.credoreference.com/content/entry/hmsciencedict/transistor/0?institutionId=1849>

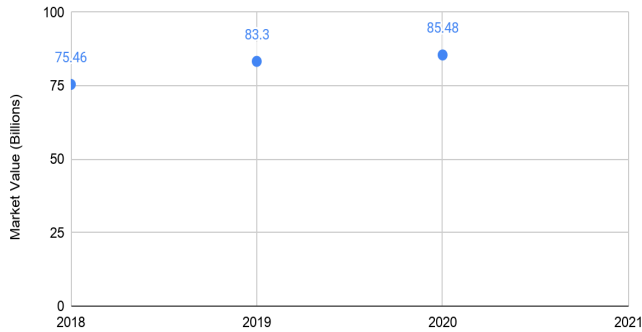
Waldrop, M. (2016). MORE THAN MOORE. *Nature*, 530(7589), 144-147.

(2019). differential equation. In Rennie, R., & Law, J. (Eds.), *A Dictionary of Physics*.: Oxford University Press.  
<https://www.oxfordreference.com/view/10.1093/acref/9780198821472.001.0001/acref-9780198821472-e-769>.

## Appendix A

Figure 1

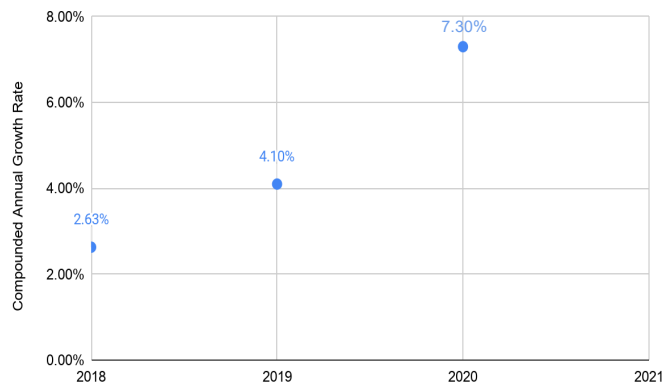
Global Microprocessor Market Value



(Markets, 2020) (Microprocessor and GPU Market Research Report, 2020) (Microprocessor Market Size Worth, 2020)

Figure 2

Global Microprocessor Market CAGR





# The Effects of Anxiety Reducing Coping Mechanisms on Nursing Students' Test Scores

Farhat F. Khairzadah

*B.S. Candidate, Department of Nursing, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

Received 16 April 2021; accepted 20 July 2021

---

## Abstract

Several studies have shown that stress and anxiety have negatively affected students' psychological well-being and test scores, especially amongst nursing students who have to deal with additional stressors in the hospital setting. Coping mechanisms that involve deep breathing, muscle relaxation, and cognitive restructuring are shown to improve students' well-being and decrease anxiety. The purpose of this research is to determine whether using these coping mechanisms will affect nursing student outcomes in regards to test scores and relief of test-anxiety. The study hypothesizes that students who implement these coping mechanisms will have improved test scores and report feeling less anxiety. The study is a mixed-method survey and experimental design that will use the Student Test Anxiety Scale developed by Nist and Diehl (1991) and a free response questionnaire. Participants included two cohorts of 30 students in the CSU Stanislaus Nursing Program. One cohort of students will listen to a pre-recorded voice thread implementing the aforementioned coping mechanisms prior to eight exams in the same class and the other cohort will serve as the control group. Data retrieved from each cohort will be compared. It is anticipated that the intervention group who implements the coping mechanisms will have decreased anxiety and higher test scores whereas the control group will have similar, or unchanging, anxiety and test scores.

*Keywords: coping mechanisms, test anxiety*

---

## Introduction

Stress and anxiety related to academia transcends between all cultures. Anxiety, worry, and feelings of self-doubt can interfere with test-taking performance and overall psychological health, and affects almost anyone who has to take any kind of exam (Centers for Disease Control and Prevention [CDC], 2020). This is problematic when considering the fact that stress related to academia is usually experienced on top of additional stressors that may be present in other aspects of student life (financial, psychological, social). Nursing students face a theory aspect of education and clinical aspect -which is an increase in the stress they are under. With this in mind, can coping mechanisms or anxiety reducing measures help improve the lives of nursing students who are faced with these heightened stressors?

Before beginning to consider coping mechanisms, the problem must be addressed: What causes stress and anxiety in nursing students? Common stressors in nursing include death and dying, increasingly complex care, and providing emotional support for families (Xuhua et al., 2018). Furthermore, the emotionally and physically demanding career can cause fatigue, sadness, and depression in nursing students (Xuhua et al., 2018). Undergraduate nursing students' high level of perceived stress was one of the main factors that contributed to overall lower levels of

psychological well-being (Xuhua et al., 2018). Some of the most common kind of stressor was lack of knowledge and professional skill, followed by taking care of patients (Sheu, Lin, & Hwang, 2001).

Other forms of stress for students include test anxiety (Abd el-Aziz, 2010). Testing is the primary means for evaluating student performance in colleges and has traditionally provided a measure of growth or achievement of student learning (Abed, 2016). One of the primary forms of stress amongst students is testing (Abed, 2016). Test anxiety refers to reactions to the possibility of negative consequences as a result of poor performance on an exam or evaluative situation (Abd el-Aziz, 2010). Testing can be stressful for even the most prepared and have a negative impact on performance (Abd el-Aziz, 2010). Furthermore, test anxiety is related to standardized test performance (Beth Ann Fulton, 2016).

According to Xuhua et al. (2018), it may not be realistic to try and remove work and study related stressors. A better approach would be to identify strategies to allow students to cope with their work environment and reduce stress and anxiety (Xuhua et al., 2018). Resilience and mindfulness were found to have an effect on positive well-being, whereas self-efficacy was found not to have a positive or negative result (Xuhua et al., 2018). Changing behaviors (thinking positively, using imagery, partaking in

stress-relief techniques) can reduce stress (Lantican, 1980).

It is important to understand that high levels of test anxiety during examinations are negatively correlated with performance (Shwarzer & Buchwald, 2003). It is clear that nursing students face stress and anxiety throughout their education, and that implementation of coping mechanisms to combat this stress are effective. Would implementing any of these coping mechanisms during exams result in changes in the level of anxiety? Deep breathing and meditation has been proven to help students academically (Paul et al., 2007).

According to the American Institute of Stress [AIS] (2012), effectively combatting stress requires activating the body's "relaxation response." The relaxation response is a state of deep rest that changes the body's physical and emotional response to stress (AIS, 2012). This resting state includes decreased heart rate, blood pressure, rate of breathing, and decreased muscle tension (AIS, 2012). Coping methods reviewed to help battle stress include deep breathing, muscle relaxation, and cognitive restructuring (positive self-affirmation). Deep breathing exercises are often used for stress management (Price, 1990). Deep breathing is an effective stress relieving technique that encourages full oxygen exchange, which slows down the heartbeat, and lowers blood pressure (Harvard Health Publishing, 2018). Progressive muscle relaxation is the process of tensing a muscle group when breathing in, and relaxing them suddenly when breathing out (Michigan Medicine, 2018). This is generally done over all the muscle groups and is found to relieve tension and stress in the muscles, especially muscles in the neck and back that may ache when under stress (Michigan Medicine, 2018). Cognitive restructuring is defined as the process of thinking in a more positive and self-deprecating manner (Price, 1990). This includes changing negative statements to positive statements and thinking in a more optimistic way. (Price, 1990). These coping methods can be implemented into daily routines to help decrease stress and promote relaxation.

The purpose current study is to implement these coping mechanisms prior to exams, with the hopes of decreasing test anxiety in students. This study will allow for determination of whether decreased anxiety affects student test scores and student psychological well-being.

### **Hypotheses**

The purpose of this study is to determine whether implementing coping and stress relieving activities (breathing exercises and positive self-affirmations) prior to theory exams will improve test score outcomes

in nursing students. The study will also evaluate whether or not students will find these activities to be an effective way of providing stress relief related to theory exams. The study hypothesizes that:

- Students who implement coping and stress relieving behaviors prior to exams will find improved test scores.
- Students will report feeling less anxiety and stress during exams following use of coping mechanisms and stress relief exercises.

### **Question**

The question that will be answered is:

- Will implementing coping strategies and stress relieving activities prior to nursing theory exams make students feel less anxious before and during the exams?

### **Method**

The sample will consist of two cohorts of 30 nursing students in their third semester in a six-semester central valley nursing program. The total number of participants is expected to be 60, unless any participants opt out of the study. The data retrieved from these students will be compared with two retrospective control groups and will be compared within two cohorts with the same didactic knowledge. The age ranges of the students will be from 20 years old to 45 years old. Institutional Review Board (IRB) approval was obtained through the university.

Informed consent will be obtained from all participants in person while class is in session in order to use grades anonymously and analyze test scores. Students will be informed that participation is voluntary and if they chose to participate, they may leave the study at any time. They will also be informed that grades will not be affected by participation. Participants who do not agree to participate in the study will be pulled from the study.

### **Design**

The design of this study will be a mixed method, survey and experimental design non-equivocal control design. Test scores will be measured to see if there is a difference between exam scores of the control group and the experimental group. Student perception will be assessed through free-response questions. Students will be given a pre-experiment survey, the intervention will be implemented, and then a post-experiment survey will be done. Independent variables include demographics, age, and ethnicity. However, these variables will not be manipulated in this study.

## Data Analysis

Data will be gathered from two cohorts of students who have taken the same Reproductive Nursing Class in a central valley nursing program. This data will be analyzed to find the mean scores on eight exams taken in the class from the first cohort in order to serve as retrospective control group for the study. Over the course of eight weeks, a new cohort in the same nursing program will take the same reproductive class and data will be gathered from eight exams. The students will take a pre-experiment survey to determine their anxiety levels. This group will also implement positive coping behaviors prior to taking the exam.

After these coping techniques are carried out for weeks, student mean exam scores will be calculated for the first eight exams. This data will be compared to that of the retrospective control group's data in order to determine whether there was a difference between the test scores in the two cohorts. This, in turn, will determine whether the intervention group had increased, decreased, or unaffected test scores while completing the intervention. A chi-squared test or t-test will be used to analyze test results. Furthermore, students will be asked to take a post experiment survey to determine if their levels of anxiety changed prior to exams throughout the course of the experiment. A nova test will be done to analyze the pre- and post-intervention questionnaire of the experimental group. Finally, the students in the intervention group will take a free response questionnaire at the end of the study. Qualitative data analysis will occur by typing in the responses on Microsoft word and emerging themes from student responses will be noted.

## Materials

The tool that will be used is the Student Test Anxiety Scale developed by Nist and Diehl (1991), which is a questionnaire used to determine whether an individual student experiences a mild or severe case of test anxiety. It consists of a 5-point Likert scale, which is a reliable test, and will be used to assess student perceptions of anxiety before and after the interventions are applied (Nist & Diehl, 1991). The test and retest method are reliable. The Likert scale will include the following answers and correlating point values: never (one point), rarely (two points), half-time (three points), often (four points), always (five points) (Nist & Diehl, 1991) (not cited in the references). These points are added up to a score between 10 and 50. A low score is between 10 and 19 points, which indicates that the student does not suffer from test anxiety at all (Nist & Diehl, 1991). A score of 20 to 35 indicates that test anxiety is experienced by the individual in a likely healthy manner. A high score

(over 35) indicates that the individual is experiencing an unhealthy level of test anxiety. The questions for the test prior to and after the intervention are shown in Appendix A.

The following questions, written by the author of this study, will be added to the post-intervention survey on a 5-point Likert scale with answers including strongly disagree, disagree, neutral, and strongly agree (Appendix B). I felt less stressed after taking exams when listening to the recording and participating in deep breathing, muscle relaxation, and stating positive self-affirmations in comparison to other exams. A free response questionnaire also developed by the author of the study will also be given to students to determine emerging themes of student perception of use of the coping methods (Appendix C).

## Procedure

The study as well as the students partaking in it will follow all procedures and policies of the school of nursing in regard to the COVID-19 pandemic. The study will be conducted online as a result of COVID-19. Informed consent will be obtained, and students will fill out the Student Test Anxiety Scale questionnaire prior to implementation of interventions. Students will begin their didactic learning and coping techniques will be implemented prior to the exam. The coping techniques will have three aspects: Positive self-affirmations, muscle relaxation, and deep breathing techniques that will cover the span of one minute. Students will be briefly be informed about the purpose of using these coping techniques, which include decreasing anxiety and providing better test score outcomes. The coping techniques will be carried out using a pre-recorded voice thread developed by the experimenter that combines deep breathing, muscle relaxation, and positive affirmations (Appendix D). Students will listen to this and then proceed to take the exam. After eight consecutive exams are given over eight weeks, the Student Test Anxiety Scale questionnaire, the additional questions about coping, and the free response questions will be completed by the students. After this, data analysis will occur and results will be identified.

## Results

The first set of results consisted of the weekly exam scores from the fall 2020 cohort (n=26) and the spring 2021 cohort (n=24). Descriptive Statistics was tabulated for both the fall and spring cohort. The results included sample size, minimum scores, maximum scores, mean scores, and the standard deviation for each weekly exam. The findings included an increase in the mean exam scores each week for the students who participated in the

intervention, as shown in the charts below (Appendix E).

The second set of results comes from the Nist and Diehl Test Anxiety Survey. A variety of questions were asked about student test anxiety, which were answered (n=22) on a Likert scale. The Likert scale consisted of five choices, including never, rarely, sometimes, always, and often. Answering sometimes, always, and often, indicated that the students did have anxiety. The results are compared between survey results from Spring 2021, which were taken prior to and after the intervention. Positive responses were recorded, which included the answers “always,” “often”, and “sometimes.”

In the first question “I have visible signs of nervousness such as sweaty palms, shaky hands, and so on right before a test,” the percentage of those who answered “always” went from 31.8% to 9.1% the second time they took the survey. The second question was “I have butterflies in my stomach before a test.” 40.9% answered “always” in comparison to 22% who answered “always” the second time around. In the third question, “I feel nauseated before a test,” the percentage of those who answered “always” went from 13.6% to 4.6%. In the fourth question “I read through the test and feel that I do not know any of the answers”, 0% answered “always” in comparison to 9.1% who answered always the second time around. In the fifth question, “I panic before and during a test,” 27.3% answered “always,” in comparison to 13.6% the second time around. In the sixth question, “My mind goes blank during a test,” the percentage of those who answered always the first time taking the survey went from 13.6% to 4.5%. In the seventh question, “I remember the information I blanked on once I get out of the testing situation,” 13.6% of students answered “always” the first time around in comparison to 4% the second time around. In the eighth question, “I have trouble sleeping the night before a test,” 13.6% answered “always,” in comparison to 13.6% in the second survey. In the ninth question, “I make mistakes on easy question or put answers in the wrong places,” the percentage of students who answered “always” went from 9.1% to 4.5%. In the tenth question, “I have difficulty choosing answers,” the percentage of those who chose always went from 9.1% to 4.3%.

In the free response questionnaire, students were asked questions on a Likert scale as well as in the form of free response (Appendix F). The Likert scale consisted of five choices, including never, rarely, sometimes, always, and often. Answering sometimes, always, and often, indicated agreement with the statements. 70% of students felt less stressed after taking exams when listening to the recording and participating in deep breathing, muscle relaxation, and stating positive self-affirmations in comparison to

other exams. 79.2% of students felt more relaxed after using coping methods before the exam. 79.2% of students answered that they would use these exercises again prior to test taking.

There were multiple themes that emerged from the free response questions. Students felt that some positive aspects of using the coping methods included a “calming effect” and that the “affirmations were beneficial” Students felt that negative aspects of using the coping mechanisms were that “in some weeks, the coping methods did not have a significant effect on my anxiety” and that “there were no negative aspects.” Finally, some student felts overall that the coping mechanisms made them feel “assured” whereas others felt that their “anxiety rose when the exam started.”

### **Overall Results**

This study determined if coping methods introduced prior to nursing student exams would increase student scores and perception of anxiety or stress related to test taking. It utilized the information provided by various studies on coping mechanisms for test taking and anxiety in students to provide information on whether using these methods directly before exams can help nursing students perform better. Overall, nursing student test scores did increase each week in comparison to the control group. Furthermore, the Nist and Diehl Test Anxiety survey and the free response question showed that anxiety levels decreased as a result of the intervention.

### **Strengths and Limitations**

Strengths included protection of human participants, which included explaining the procedures, obtaining informed consent, receiving University Institutional Review Board approval, and ensuring the participants were aware their grades would not be affected should they choose to opt out of the study. Instrumentation was another strength achieved through use of the Nist and Diehl Test Anxiety Survey.

There were a large number of limitations in this study. Limitations of this study included convenience sampling, a small sample size, use of a pre-test and posttest, and that nursing students often already have pre-existing anxiety. Use of convenience sampling and a small sample size limit the generalizability of the research. The use of a pre-test and post-test can cause bias. This is due to the participants seeing the questions twice and the possibility of them answering in favor of the research. Furthermore, another limitation includes that the study did not obtain demographic information such as age, ethnicity, or socioeconomic status. This information would have provided further insight on the participants. For

example, older students are generally found to work harder, first generation students may not have as much knowledge, and students with low socioeconomic status may not have as many resources.

### Implications for practice

Nursing students often face stress and anxiety as a result of dealing with death, increasingly complex care, fatigue, sadness, and rigorous coursework (Xuhua et al., 2018). Decreasing their test anxiety can be a way to decrease the load that they must handle. Given that this study revolved around test-taking, stress, and anxiety, it can be generalizable to students in any field who take exams and experience stress or anxiety. Students can use this information to find their own way of coping with stressors related to test anxiety and their education. Furthermore, educators can use this information in order to help their students cope with difficult exams.

### Future research

This study can be significant in future research as it will provide a basis for other programs to test and possibly implement coping mechanisms to help improve student success. Doing so may decrease student stress and improve nursing student outcomes. This study enhances the body of knowledge related to test taking, test anxiety, and coping mechanisms. Furthermore, it evaluates if coping techniques are effective in decreasing anxiety. Understanding of whether this helps the students increase their test scores is also valuable knowledge as it will allow for students and teachers to use this information and apply coping techniques into their own lives. Further research should be done over a large population and does not need to be limited to students in nursing programs.

## Figures

Student Mean Exam Score

| Descriptive Statistics Fall 2020 |    |         |         |         |                |
|----------------------------------|----|---------|---------|---------|----------------|
|                                  | N  | Minimum | Maximum | Mean    | Std. Deviation |
| Exam 2 Fall                      | 26 | 13.00   | 17.91   | 15.4096 | 1.47633        |
| Exam 4 Fall                      | 26 | 9.00    | 18.00   | 14.5769 | 2.45231        |
| Exam 5 Fall                      | 26 | 14.00   | 23.00   | 20.1154 | 2.30351        |
| Exam 6 Fall                      | 26 | 10.50   | 19.00   | 15.4038 | 2.25951        |
| Exam 7 Fall                      | 26 | 8.00    | 19.75   | 12.8077 | 2.94305        |
| Exam 8 Fall                      | 26 | 8.50    | 18.00   | 14.1346 | 2.44768        |
| Exam 9 Fall                      | 26 | 5.00    | 17.00   | 12.9615 | 2.93231        |
| Exam 10 Fall                     | 26 | 12.25   | 20.25   | 15.5319 | 1.87062        |
| Valid N (listwise)               | 26 |         |         |         |                |

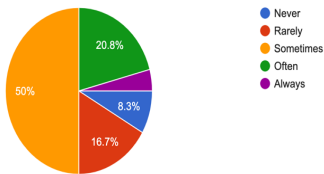
Figure 1

| Descriptive Statistics Spring 2021 |    |         |         |         |                |
|------------------------------------|----|---------|---------|---------|----------------|
|                                    | N  | Minimum | Maximum | Mean    | Std. Deviation |
| Exam 2 Spring                      | 24 | 14.83   | 24.25   | 18.9021 | 2.72343        |
| Exam 4 Spring                      | 24 | 14.00   | 21.00   | 17.8750 | 2.23242        |
| Exam 5 Spring                      | 24 | 17.75   | 24.50   | 20.7917 | 1.93743        |
| Exam 6 Spring                      | 24 | 15.42   | 22.75   | 18.8054 | 1.94717        |
| Exam 7 Spring                      | 24 | 12.50   | 23.00   | 17.5938 | 2.72849        |
| Exam 8 Spring                      | 24 | 9.00    | 21.00   | 17.2813 | 2.83544        |
| Exam 9 Spring                      | 24 | 12.40   | 20.00   | 17.0417 | 2.35832        |
| Exam 10 Spring                     | 24 | 12.33   | 20.75   | 17.2183 | 2.18010        |
| Valid N (listwise)                 | 24 |         |         |         |                |

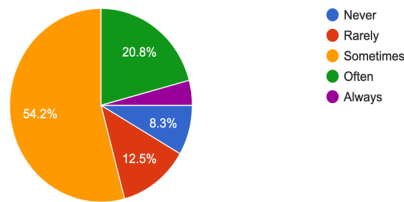
Figure 2

## Post Intervention Likert Scale Survey Results

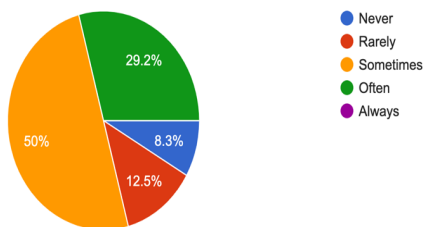
I felt less stressed after taking exams when listening to the recording and participating in deep breathing, muscle relaxation, and stating positive self-affirmations in comparison to other exams.  
24 responses



I felt more relaxed after using coping methods before the exam.  
24 responses



I will use these exercises again prior to test taking  
24 responses



## References

- [1] Abed, B. K. (2016). Test-taking anxiety of University of Technology students. 25-36.
- [2] Abd el-Aziz, L.T., Eid, N.M., & Safan, S.M. (2010). Test anxiety, and skills of time management among faculty nursing students. *Journal of American Science* 8(4).
- [3] American Institute of Stress [AIS]. (2012). Take a deep breath. <https://www.stress.org/take-a-deep-breath>
- [4] Centers for Disease Control and Prevention [CDC]. (2020). *Test anxiety: Can it be treated?*<https://www.mayoclinic.org/diseases-conditions/generalized-anxiety-disorder/expert-answers/test-anxiety/faq-20058195>
- [5] Fulton, B. A. (2016). The relationship between test anxiety and standardized test scores. *Walden Dissertations and Doctoral Studies*. <https://scholarworks.waldenu.edu>
- [6] Guruprakash, K. V., Mehta, S.G., Atul, B., Prakash, J., Divinakumar, K. J., Khan, S. A., & Patra, P. (2018). A study of relationship between perceived stress, coping pattern, burnout, and general psychopathology among the postgraduate medical students. *Industrial Psychiatry Journal*, 27(1), 141-146. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6198606/>
- [7] Harvard Health Publishing. (2018). *Relaxation techniques: Breath control helps quell errant stress response*. <https://www.health.harvard.edu/mind-and-mood/relaxation-techniques-breath-control-helps-quell-errant-stress-response>
- [8] Lantican L. S. (1980). Effects of coping skills training on nursing students' reaction to a stressful situation. *Academy of Nursing of the Philippines Papers*, 16, 2-20.
- [9] Michigan Medicine. (2018). *Stress management: Doing progressive muscle relaxation*. <https://www.uofmhealth.org/health-library/uz2225>
- [10] Paul, G., Elam, B., & Verlhulst, S. J. (2007). A longitudinal study of students' perceptions of using deep breathing meditation to reduce testing stresses. *Teaching and Learning in Medicine* 19(3), 287-292. <https://doi.org/10.1080/10401330701366754>
- [11] Price, E. C. (1990). Capitalizing on stress management techniques in developmental classes. *Alabama Association of Developmental Education*, 2-39.
- [12] Reteguiz, J. A. (2006). Relationship between anxiety and standardized patient test performance in the medicine clerkship. *Journal of General Internal Medicine*, 21(5), 415-418.
- [13] Sheu, S., Lin, H., & Hwang, S. (2001). Perceived stress and physio-psycho-social status of nursing students during their initial period of clinical practice: The effect of coping behaviors. *International Journal of Nursing Studies*, 39, 165-175.

- [14] Shwarzer, C., & Buchwald, P. (2003). Examination stress: Measurement and coping. *Anxiety, Stress, and Coping*, 16(3), 247-249.
- [15] Xuhua He, F., Turnbull, B., Kirshbaum, M. N., Phillips, B., & Klainin-Yobas, P. (2018). Assessing stress, protective factors and psychological well-being among undergraduate nursing students. *Nurse Education Today*, 68, 4-12

# Eating Disorders and their Lasting Effects in Competitive Athletes

Rachel Klopher

*B.S. Candidate, Department of Biological Sciences, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

*Received 14 May 2021; accepted 20 July 2021*

---

## Abstract

Disordered eating habits and body image issues often go unnoticed in athletes because the disordered behavior has become a normalized part of being a competitive athlete. Participation in high level competitive sports may be linked to an increased frequency of disordered eating habits. This study will be comparing the Eating Disorder Examination Questionnaire (EDE-Q) scores of competitive athletes against those of non-athletes. The EDE-Q is a self-reported questionnaire adapted from the Eating Disorder Examination Interview developed by Cooper and Fairburn (1987) used to range the severity of behaviors associated with an eating disorder diagnosis. The EDE-Q is derived from what the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) lists as symptoms of a clinically diagnosable eating disorder. It is important to analyze and study this topic in order to raise awareness that individuals who seem to live healthy lifestyles and look physically fit can be struggling with unhealthy habits. If made aware of this, athletic institutions could provide more knowledge and resources on this topic as well as educating and training staff to handle these issues. The data collected in this study showed that athletes (current and former) scored higher on the EDE-Q on average than non-athletes, indicating that athletes are partaking in disordered eating habits at a higher frequency than non-athletes and therefore are at a higher risk of developing a clinically diagnosed eating disorder.

*Keywords: Eating Disorders, athlete, disordered eating, body image*

---

## Introduction

An eating disorder is a psychological disorder characterized by abnormal or disturbed eating habits. Eating disorders often stem from disordered eating habits such as restriction, calorie counting, fasting, purging, and excessive exercise that if unchecked put an individual at a high risk of developing a diagnosable disorder. The majority of individuals with eating disorders are never diagnosed and never seek treatment (Hart et al., 2011). Some of the risk factors for developing an eating disorder can be related to environment, social pressure, and personality (Pearson & Rivers 2005). A significant amount of athletes' experience risk factors in all three of these areas. A high-level athletic environment is high pressure, competitive, and high stress. According to Lazarus and Folkman's stress theory (1984), when an individual experiences internal or external stressor, they turn to behavioral responses and coping mechanisms that attempt to manage stress. These can be positive or negative coping mechanisms. Disordered eating is one of the common negative coping mechanisms. Along with environmental factors athletes also are under social pressure to look a certain way to fit the expectations of an athletic body. Athletes also often possess personality traits that can be a risk factor for eating disorders such as perfectionism, drive, high self-expectations, and competitiveness (Picard 1999).

Prior research has shown that as many as 20% of the female and 8% of the male athletes met the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) criteria for anorexia nervosa, bulimia nervosa, and eating disorders not otherwise classified compared with 9% and 0.5% for female and male controls (Sundgot-Borgen 1993). A similar study including 1620 athletes and 1696 controls found similar results—20% of female athletes met criteria for an eating disorder, compared to 9% of female controls (Sundgot-Borgen 2004). There is also a study from 2015 that showed that female elite athletes and females with diagnosed eating disorders have similar risk levels and behavior, but females with a diagnosed eating disorder are at risk of avoidance eating disorder tendencies (restriction, fasting, etc.) while female elite athletes are at risk of approach eating disorder tendencies (purging, bingeing, etc.) (Müller et al., 2015).

This study will be comparing the Eating Disorder Examination Questionnaire (EDE-Q) scores of current and former competitive athletes against non-athletes. The purpose of this study is to bring attention and awareness to the unhealthy mindsets and disordered eating habits developed by many athletes brought on by fixation on the body and its look and performance as well as the intense perfectionism that many competitive athletes possess. Many athletes develop eating disorders that affect their long-term health and relationship with food and their bodies.



However, many of them go undiagnosed because of the normalization of disordered eating in competitive athletics. In this study, data will be analyzed in order to support the hypothesis that athletes, current and former, will on average score higher on the EDE-Q than non-athletes. Competitive athletes have normalized disordered eating and are more likely to develop diagnosable eating disorders or have higher frequency of disordered eating that persists even after they are no longer competing athletically.

## Methods

### Participants

Data was collected from 75 participants ranging from ages 18-56. Participants were required to be at least 18 years of age to participate in this study. 31 participants (41%) identified themselves as a current athlete. 20 participants (27%) identified themselves as a former athlete. 24 participants (32%) identified themselves as non-athletes. Participation in this study was voluntary. 16 participants (21%) identified as male. 69 participants (79%) identified as female.

### Measures

The measuring protocol for this study was derived from an existing measurement system used in scoring the EDE-Q developed by Fairburn, Cooper, and O'Connor (2014). The EDE-Q consists of 28 frequency questions that the participant scores on a 0-6 scale. The questions measure the frequency that an individual has partaken in certain thoughts or actions in the past 28 days. No days would correspond to a 0 score, 1-5 days is a 1 score, 6-12 days is a 2 score, 13-15 days is a 3 score, 16-22 days is a 4 score, 23-27 days is a 5 score, and every day is a 6 score. Higher scores indicate higher frequency of disordered eating habits or thoughts. The EDE-Q consists of four subscales. These subscales are restraint, eating concern, shape concern, and weight concern. The participant receives an average 0-6 score for each subscale and then a global score is derived from the average of those four subscale scores. Scores of 4 or higher indicate being within clinical range. Scores of 3.9 and below indicate normal range.

### Procedures

The EDE-Q can be administered verbally in an interview style setting or electronically. Due to health and safety restrictions brought on by COVID-19, the EDE-Q was administered electronically and the participant filled out the questionnaire independently for this study. The EDE-Q and informed consent document was sent via email, filled out by the participant independently, and then sent back to me via email. Data was collected

anonymously. Completed questionnaires were labelled as current athlete, former athlete, or non-athlete. The age and gender of the participant was also included on the questionnaire.

### Data Analysis

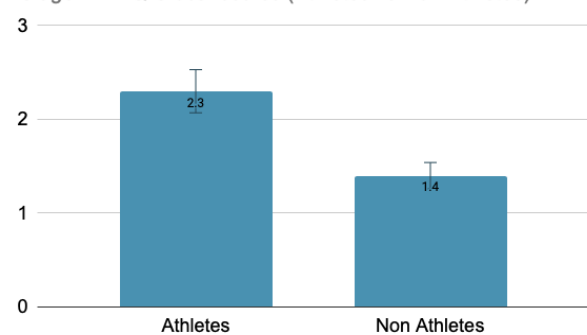
An ANOVA test was used to determine the significance of the data using the mean scores of current athletes, former athletes, and non-athletes. Through this test, the results of this study were proven statistically significant ( $p < .05$ ). The score of each individual was calculated using an existing equation designed by Cooper, Fairburn, and O'Connor (2014). Global scores were first divided into two groups (athlete and non-athlete) and the average of these scores was taken for both groups and compared for analysis. Next, the original global scores were divided into three groups (current athletes, non-athletes, and former athletes) and the average global score of all three groups was calculated and compared.

## Results

My results showed that athletes (current and former) had an average global score of 2.3 while non-athletes received an average global score of 1.4, (see Figure 1) showing that athletes did partake in disordered eating habits more frequently than non-athletes.

Figure 1

Average EDE-Q Global scores (Athletes vs Non Athletes)

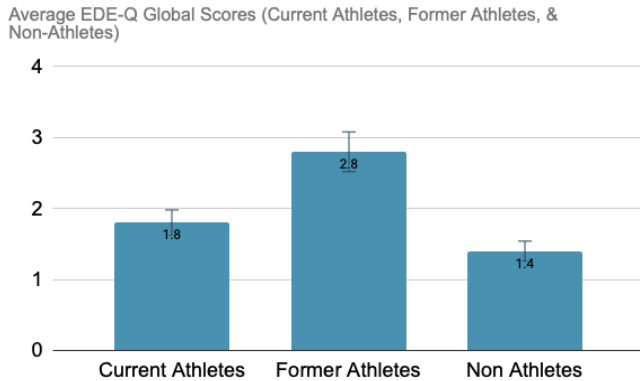


$p < .05$ .

However, the results were broken down even further. Instead of comparing only athletes against non-athletes, I also took data on the participants split up into three groups. Those groups being current athletes, former athletes, and non-athletes. When analyzing the data this way, the results showed that current athletes had an average global score of 1.8, former athletes had an average global score of 2.8, and non-athletes had an average global score of 1.4 (See Figure 2). Interestingly, these results showed that

former athletes are scoring the highest in frequency of disordered eating compared to current and non-athletes.

Figure 2



$p < .05$ .

While receiving different average global scores, the three groups also all had a different highest scoring subscale (meaning the section of the questionnaire that the individual scored the highest on). Current athletes' highest scoring subscale was Weight Concern. Their average score in this category was 2.6. Former athletes' highest scoring subscale was Shape Concern. They averaged a score of 4.1 in this subscale, which is within clinical range. Finally, non-athletes' highest scoring subscale was Restraint with an average score of 2.4 in this subscale

## Discussion

As predicted, athletes did, on average, score higher on the EDE-Q than non-athletes. These results indicate that individuals who compete in a competitive sport partake in disordered eating habits and unhealthy thoughts surrounding body image and weight more frequently than their non-athlete counterparts. Although both groups showed to be in normal range on average, the athletes' average score shows that they trend toward ED risk behaviors more than non-athletes. This difference in behavior could stem from the competitive atmosphere of athletic environments as suggested in Lazarus and Folkman's Stress Theory (1984) or the emphasis placed on body performance, but this data alone cannot prove a concrete cause and effect relationship with these factors and eating disorders.

The scores showed that former athletes had the highest average global score of all three groups indicating that individuals who used to play sports competitively, but no longer participate are partaking in disordered eating and thinking most frequently.

While former athletes no longer have the external stressor of a competitive athletic environment, they still have internal stressors such as the personality traits of an athlete that make them high risk for eating disorders, so they continue to turn to negative coping mechanisms.

The analysis of the different subscale scores indicated what each group's most significant disordered behavior was. Current athletes, on average, struggle most with weight concern. Former athletes struggle most with shape concern, even having an average score within clinical range. Non athletes struggle most with restraint. Current athletes' concern lies in numerical and statistical concepts such as weight. This could be related to performance and the idea of "losing five pounds will make you run a little faster or jump a little higher" that has been pushed on them in their environment. Former athletes' biggest concern lies in their physical appearance. This could be interpreted as the desire to have their body look the same way that it did when they were in training for high level competition. Non-athletes' concern themselves with amounts, limits, and control. They partake in disordered eating habits such as intense dieting or food restriction. They are able to do this more frequently because high intensity body performance is not a concern in their daily life. Setting these hard limits and rules for themselves that can be harmful even at a low activity level.

## Limitations

There were some factors that are considerable limitations to this study. One limitation was the sample size of 75 people. This was a relatively small sample for this study and small sample sizes can skew data. Another limitation was the lack of male participation. There were only 16 male participants in this study and because of this I was not able to make meaningful comparisons of the results on the basis of gender as was initially intended. Possibly one of the biggest limitations to this study was the fact that disordered eating cannot always be recognized by the individual partaking in it. Some participants can be engaging in abnormal eating habits, but they may not have reported them as abnormal in this study because they have normalized their own habits. Eating disorders are psychological disorders and it can be difficult for someone who does suffer from an eating disorder to be open and honest about these behaviors. The topic of this study is a sensitive one, while participants gave full informed consent, it can still be difficult to be forthcoming with such personal information and we must consider that when analyzing the results.

## Conclusion

My hypothesis that athletes would score higher on the EDE-Q than non-athletes was supported by my results. While I anticipated that former athletes would score similarly to current athletes, I did not expect that former athletes would score higher than current athletes. With this data, I can conclude that former athletes may struggle more than current athletes with eating and body image because they are no longer in the high level of training that they have become accustomed to and their body will go through changes reflecting that. This internal stress causes them to turn to disordered eating as a coping mechanism more frequently.

This study shows that there is a certain pressure and environment that is created in competitive athletics in which the athletes are developing more disordered eating than their non-athlete counterparts. It also shows that the effects of this are long term and will continue to be a factor even after competition has stopped.

The significance of my findings is that conversations about eating disorders and body image need to be had with both athletes and athletics staff in order to be more aware of risk factors. There also needs to be improvement of how individuals in athletic leadership roles work to prevent abnormal habits and provide more resources to athletes. With this information in mind, hopefully the world of competitive athletics can work to create and promote more positive coping mechanisms to replace the unhealthy ones such as disordered eating.

## References

- [1] Fairburn, C. G., & Beglin, S. J. (1994). Eating Disorder Examination Questionnaire (EDE-Q)
- [2] Fairburn, C., Cooper, Z., & O'Connor, M. (2014). Eating Disorder Examination (Edition 17.0D; April 2014)
- [3] Hart, L. M., Granillo, M. T., Jorm, A. F., & Paxton, S. J. (2011). Unmet need for treatment in the eating disorders: A systematic review of eating disorder specific treatment seeking among community cases. *Clinical Psychology Review, 31*(5), 727-735. doi: 10.1016/j.cpr.2011.03.004
- [4] Lazarus, R. S., & Folkman, S. (1987). *Stress, appraisal, and coping*. New York: Springer.
- [5] Müller, A., Claes, L., Wos, K., Kerling, A., Wünsch-Leiteritz, W., Cook, B., & De Zwaan, M. (2015). Temperament and risk for exercise dependence: Results of a pilot study in female patients with eating disorders compared to elite athletes. *Psychopathology, 48*(4), 264-269. doi:10.1159/000436978
- [6] Pearson, F. C., & Rivers, T. C. (2005). Eating disorders in female college athletes: Risk Factors, Prevention, and Treatment. <https://files.eric.ed.gov/fulltext/EJ902801.pdf>
- [7] Picard, C. L. (1999). The level of competition as a factor for the development of eating disorders in female collegiate athletes. *Journal of Youth and Adolescence, 28*(5), 583-594. doi:10.1023/a:1021606710398

# Diverse Coping Strategies for COVID-19 Related Stressors

Lisa Lynn Lewis

*B.A. Candidate of Cognitive Studies / B.A. Candidate of Psychology with Experimental Concentration  
California State University Stanislaus, 1 University Circle Turlock, CA. 95382*

Received 16 April 2021 accepted 20 July 2021

---

## Abstract

Since the onset of the global Coronavirus pandemic, many citizens have reported significantly heightened levels of stress and stress-related illnesses. Previous research suggests high levels of stress contribute heavily to both short- and long-term stress-related illnesses or disease. The purpose of this study is to explore the cognitive, societal, and interpersonal relationships between diverse coping strategies and COVID-19 related experiences. Our aim is to establish a link between external stress management techniques and internal coping capabilities among individuals exposed to COVID-related stressors. Utilizing an awareness of one's internal and external state through present moment observation, without judgement; known as *mindfulness*. Mindfulness-based stress reduction has proven helpful in the development and practice of cognitive coping strategies beneficial for maintaining long-term mental health. Mindfulness requires no professional training or physical equipment and may be applicable across diverse cultural backgrounds and demographics. This study proposed individuals who utilized internal and external coping techniques based in mindfulness would report the lowest scores of COVID-related stressors. Online survey data collection explored respondents' physical and mental practices to cope with stress common during the global COVID-19 pandemic.

*Keywords: mindfulness, stress management, COVID-19, coping strategies, daily stressors, Mindfulness-based stress reduction, proactive and maladaptive coping techniques*

---

## Background

The physical and physiological responses to stress can influence the capabilities of the human body and brain. Americans routinely engage in stress-inducing activities as a part of modern life, affecting us mentally as well as physically. Consistent stress exposure can lead to devastating manifestations of ailments, disorders, and diseases within the psychological brain, effects the mental habits of the mind. Yet, daily stress has become an expected way of life despite the implications for deleterious psychological performance. The global pandemic of COVID-19 brought monumental levels of stress and introduced new stressors to everyday normalcy as citizens worldwide managed to cope. Distinctive stress and anxiety symptoms developed in response including fear of becoming infected or coming into contact with a contaminated surface, socio-economic anxiety about the pandemic consequences, and traumatic stress symptoms (Taylor, et.al., 2020.) The Merriam-Webster dictionary added 535 new words in 2020 including many now relevant crises-related terminologies: *social-distancing* in public, *contactless* delivery options and wearing personal protective equipment (PPE; Merriam-Webster, 2020). The universal tension surrounding the uncertainty of the COVID-19 virus affected the livelihood of families everywhere through unexpected closures, layoffs, or other changes at work including working from home and closures of schools and universities. As many branches of societal expectations and public health morphed over time with the latest COVID-19 data and CDC recommendations, citizens everywhere had very different guidelines to define stress exposure. Among the Canadian and American general population, 48% reported anxiety and depressive symptoms in response to COVID-19

(Taylor, et. al.; 2020).

Brain health effects the body as well as the mind through the brain-body connection. Our central nervous systems are constantly scanning environments for signs of danger. The way we learn to manage and react to daily stress is critical for the healthy advancement of brain health over short and long term (Southwick, & Charney, (2012). Proper brain-functioning includes the development, practice, and execution of mental or *cognitive* tasks such as: direction of attention, memory formation, emotional regulation, language formation (including self-talk), and ultimately, personal stress management. Scientific literature strongly suggests the negative effects of high stress levels and the associated stress-related hormones shown to physically alter brain structures and alter cognitive capabilities (Flor & Nees, 2014). With stress levels of COVID-19 reaching paramount levels for many citizens, the implications of stress on our daily thoughts and behaviors are something worthy of consideration (Ghebreyesus,2020). As stress continues to rise, the mental health of individuals across the globe may be hanging in the balance of now and a post-COVID world.

In order to further understand internal coping habits, Kerstin Schroder and Cindy Ollis introduced a measurement tool to the field of cognitive motivation & emotion: The Coping Competence Questionnaire. This innovative design assesses individual resilience against helplessness and depression by examining measures of depressive symptoms, neuroticism, and stress reactions. An individual with a high level of *coping competence* is in the capacity to effectively cope with failures and negative life events. Indication of such competency can be observed by a reduced likelihood of helplessness reactions and a fast recovery from any occurring helplessness symptoms

(Schroder & Ollis, 2013). Since the nature of competence is internal to each participant, the survey is intended to empirically measure coping competence by self-reported data. Interpersonal coping styles may be categorized as *proactive* if the aim of coping strategies used is the avoidance of destructive cognitive habits (i.e.: self-blame, rumination, or over-emphasizing negative experiences) and/or automatic responses (Ridder, 2017); as *maladaptive* coping strategies which aim only to replace the stress with some temporary distraction (self-blame, overworking, self-harm), and a *mindful* strategy of coping, which aims to build long-term healthy habits to effectively manage stress through techniques of self-observation of personal thoughts, emotions, and other present moment experiences, without immediate or emotional judgement or reaction (Miao et.al.,2017). Examples of mindful strategy use includes simple acts like counting to ten prior to responding, taking a deep breath while flustered, or actions with more intention, such as meditation or a spiritual weekend get-away. Utilizing proactive, or mindful coping rather than maladaptive coping techniques for managing stressful experiences helps mitigate the negative effects of stress-related hormones, encourages greater resilience to adversity, increases the ability to buffer against disease and quickens recovery from adverse experiences.

This study aims to identify the relationship among specific coping strategies and techniques used by adults during the global pandemic and their effect on the exposure to stressful events. We hypothesize that participants who report high cognitive or interpersonal coping scores will also report high levels of external coping strategy usage. Additionally, we those who score high on interpersonal coping strategies will report lower stressful recent events experienced during the COVID-19 pandemic, and finally, that respondents who report the highest usage of mindful coping strategies will have the lowest stressful recent events occurred.

## Methods

With the approval of the university Psychology Institutional Review Board, postings and participation for this research were entirely online advertised on Mechanical Turk (MTurk), Amazon's online subject pool, and on the researcher's social media platforms, including the university textbook student exchange. Participants via MTurk were compensated 25 cents for their completed survey, per MTurk design. Additionally, any sourced participants who consented were entered into a raffle for a chance to win one \$25.00 Amazon gift card for every 25 survey participants. Participants signed up and participated at a time that was convenient by using the link to the survey administered in Qualtrics, a web-based platform for distributing surveys.

During the online international data collection, participants were presented with a consent form to read and accept; explaining plans to collect anonymous data and option not to disclose any answers which make them uncomfortable. Upon consent, respondents were asked eight demographic questions: age, race/ethnicity, location, county (if in the USA), educational status, student status and applicable program, as well as occupation. Next, the following four questionnaires aimed to explore the

interpersonal cognitive and external physical strategies used to cope with COVID-19 related stress and to identify the number stressful recent events each participant had experienced over the previous six months.

- Coping Competence: eight questions selected from The Utrecht Proactive Coping Competence Scale (2017) examining measures of an individual's competency with regard to various strategies and skills associated with proactive coping. Used to measure participant practice of techniques characteristic of proactive coping practices.
- Emotional Regulation: ten questions selected from Garnefski et. al.'s Cognitive Emotional Regulation Questionnaire (CERQ): a measurement of depressive and anxious symptoms and the use of the following nine coping strategies: acceptance, catastrophizing, other-blame, positive reappraisal, putting into perspective, refocus on planning, positive refocusing, rumination, and self-blame. Used to measure the cognitive coping strategies and thoughts about having experienced stressful or traumatic events and groups strategies into nine categories of cognitive coping techniques ranging from poor to healthy in practice.
- Schedule of Recent Experiences: seventeen questions asking respondents to identify how often specific events had happened over the previous six months, adapted from Thomas Holmes, M.D.'s full-length survey. The chosen questions were events applicable to the global occurrences which became well-known throughout the pandemic.
- Perceived Stress Scale: a four-question measurement of self-reported individual amount of recent stress over the previous month, selected from Cohen et. al, (1983) full survey. This variable was intended to offer a reflection of interpersonal participant stress levels when compared to their external experienced stress scores.

The last of the questionnaire asked participants to identify used physical, emotional, social, and spiritual coping techniques to personally manage their stress by identifying any applicable techniques from a researcher-created list of common stress-management strategies, both proactive and reactive including MBSR and other types of physical, emotional, social, and spiritual coping techniques used. Respondent coping techniques were scored appropriately as maladaptive (rumination of past events, blame of self or others, pity, etc.), proactive (setting boundaries, asking for help, etc.) or MBSR (meditation, breath work, or journaling) based techniques. Scores ranged from zero to three with MBSR being worth the most points on the survey, respectfully. Finally, the debriefing form followed. Data analysis was conducted via SPSS to identify any relationships among coping techniques and occurrence of COVID-related stressful

events.

## Results

Demographical results across the 300 participants appropriately represented the United States population as a whole, with appropriate ethnical and location representation, respectfully. Nationwide and international respondents were reported from the following 14% California, 11% International, 15% Texas, 8% Washington, 6% New York, and 46% other US states. The mean participant age was 36 years old ( $SD = 13.19$ ) with 42% of respondents reporting holding a graduate degree, 32% reported a 4-year degree or equivalent, 21% reported some college. Additionally, 23% were currently attending school.

In order to determine the effects of our variables, 2 x 2 x 2 factorial ANOVA was performed with Perceived Stress Score (PSS; extreme lows and extreme highs), Cognitive Coping Score (CCS; extreme lows and extreme highs), and Mindfulness Based Coping Score (MBSR; low and high usage) as predictive variables to the outcome variable of reported Stressful Recent Events (SRE). Analysis revealed statistically significant effects for Perceived Stress Score ( $M = 12.87$ ,  $SD = 2.98$ ),  $F(1, 84) = 13.88$ ;  $p < .001$ ;  $\eta^2 = .14$ . This is a large effect size, indicating that 14% of the variance in recent stressful occurrences can be attributed to the PSS. There were also two interaction effects which were significant. The first interaction effect was Perceived Stress Scores x Cognitive Coping Scores,  $F(1,84) = 16.17$ ,  $p < .001$ ,  $\eta^2 = .16$ . This is a rather large effect size which indicated that 16% of the variance in SRE may be attributed to the interaction of PSS and CCS. The other statistically significant interaction effect was Perceived Stress Score x Mindfulness-Based Stress Reduction usage,  $F(1, 84) = 5.47$ ,  $p = .02$ ,  $\eta^2 = .06$ . This medium effect size indicated that 6% of the variance in reported SRE can be attributed to the interaction of PSS and MBSR. See Table 1 for cumulative ANOVA results.

The interaction for PSS and CCS had the largest effect size (Partial  $\eta^2 = .16$ ) and as the interaction plot (Figure 1) suggests, individuals who reported the highest SRE had scores high on CSS & on PSS. This may suggest that a greater internal awareness, as represented through the CCS measure, supplies an accurate representation of actual stressful events, as supported by accompanying high PSS. The scatter plot presented in Figure 2 represents these data. Appropriately, individuals who reported the lowest SRE were also in the high CCS group with low PSS. Among respondents who scored the lowest on CCS, scores for SRE were relatively similar with a very tight variance ( $M_1 = 22.00$ ,  $SD_1 = 21.99$ ;  $M_2 = 29.00$ ,  $SD_2 = 21.91$ ; see Figure 3). This may suggest that lower internal awareness, represented by CCS measure does not supply an accurate reflection of actual stressful events occurred. There were no other interactions to report.

Table 1

*ANOVA results using total number of stressful recent events occurred over the past six-months as the criterion variable and the following three predictor variables and interaction effects.*

| Predictor Variable   | Sum of Squares  | F             | P                | Partial $\eta^2$ |
|--|-----------------|---------------|------------------|------------------|
| <b>Intercept</b>   | <b>48040.31</b> | <b>170.85</b> | <b>&lt; .001</b> | <b>.40</b>       |
| <b>Perceived Stress Score</b>  | <b>3902.43</b>  | <b>13.88</b>  | <b>&lt; .001</b> | <b>.14</b>       |
| MBSR   | 367.43          | 1.31          | .256             | .01              |
| External Coping Score  |                 |               |                  |                  |
| Cognitive Internal Coping Score                                      | 105.86          | 0.38          | .541             | .004             |
| <b>Cognitive Internal x Perceived Stress MBSR x Perceived Stress</b> | <b>4547.53</b>  | <b>16.17</b>  | <b>&lt; .001</b> | <b>.16</b>       |
| <b>Perceived Stress Cognitive Internal x MBSR</b>                    | <b>1537.17</b>  | <b>5.47</b>   | <b>.02</b>       | <b>.06</b>       |
| <b>Perceived Stress Cognitive Internal x MBSR</b>                    | 443.11          | 1.58          | .21              | 0.2              |
| <b>Cognitive x MBSR x Perceived Stress</b>                           | <b>68.31</b>    | <b>.24</b>    | <b>.62</b>       | <b>0.003</b>     |

Note: bolded data represent statistically significant findings; all  $df = (1, 84)$ .

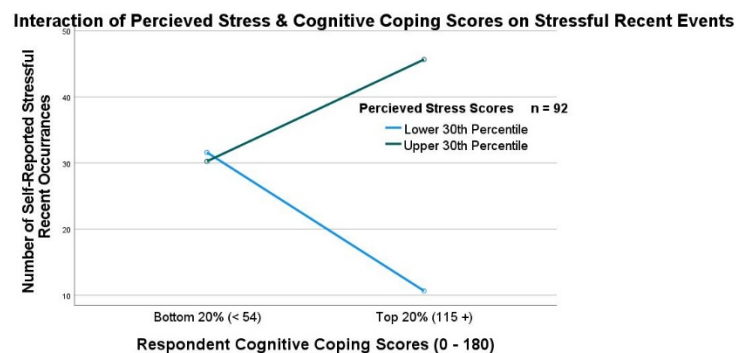


Figure 1: Interaction plot for predictor variables: perceived stress score & cognitive coping score on outcome variable of number of occurrences of stressful recent events over the past six months. When viewing the upper and lower percentiles, we see a clear interaction among the predictor variables, as indicated by the intersecting lines. Overall, those with the highest occurrences of stressful events were those who scored highest PSS as well as scored highest CCs.

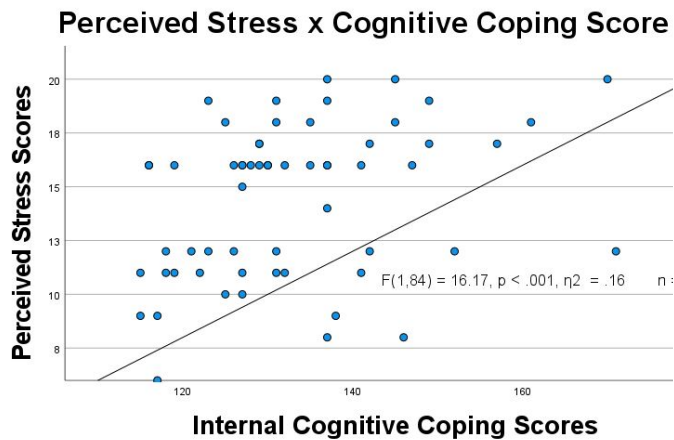


Figure 2: Scatter plot for interaction of predictor variables: perceived stress score & cognitive coping score.

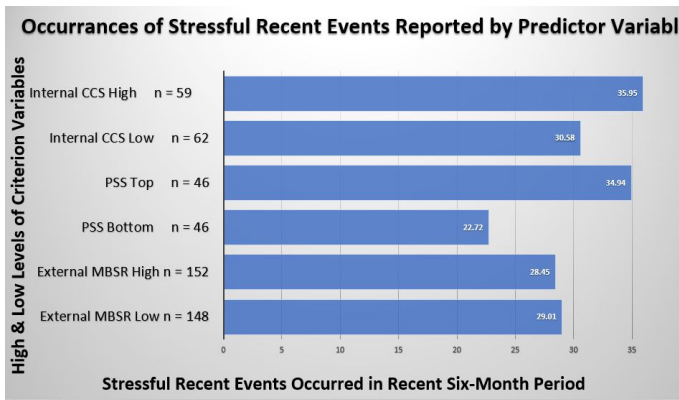


Figure 3: Occurrences of stressful recent events reported by each predictor variable group consisting of high and low scores, Internal cognitive coping scores (CCS) were divided into low scores of fifty-four or less and high scores of 115 or above. Perceived Stress Scores (PSS) were categorized by the bottom 31% who ranked scores lower than eleven and the top 29% who scored fifteen or lower. The external Mindfulness-Bases Stress Reduction coping scores were grouped into low scores of three or less and high scores of four or higher.

## Discussion

The opportunity to examine the effects of globally rather than locally sourced stressors to identify the diverse coping techniques used among participants provides a unique research perspective to build upon the previous scientific research on stress and mindfulness. From the fifty-one options for external, physical actions taken to strategize the reduction of stress, only twelve strategies were reported across our entire sample. Spiritual and emotional strategies were the least reported while physical actions easily taken at home. Over one third of the respondents implied they use reading, recreational hobbies, or spending time with pets to manage their daily stress. As understanding of COVID-19 continues to develop and social and nationwide guidelines continue to change; for many, it may be time to consider a new approach to managing stress. Many of the MBSR strategies listed in

our survey were reported as not being a stress reduction strategy whatsoever for our participants, including prayer, gratitude, or adjustment of interpersonal expectations. This leads to suspicion of respondent inattention due to the online format and incentive offered.

The large effect of significance found between the Perceived Stress Scores and the Schedule of Recent Experiences lays a solid foundational assumption that respondents have an accurate representation of stress in their lives. Individuals who reported high SRE also reported high PSS and vice versa, respectfully. The most commonly reported stressful recent event was a change in personal habits, change in recreation amount, and a change in amount of time spent sleeping and eating. Surprisingly, despite the COVID-19 pandemic, less than 18% of respondents reported the death of a family member or a friend. It may be possible that the participating MTurk survey respondents had a disproportionately low exposure to COVID-19 related stress. One explanation for this could be the large majority of graduate degree holding business occupational respondents. These jobs, although deemed essential, may have had a smooth transition to working remotely from home and sheltering in place.

In regard to the interaction effect found to be significant among PSS and MBSR, it seems that those who have high PSS, generally have higher SRE than those who have low PSS. Among high PSS individuals, those who have lower MBSR strategies have more stressful experiences than those who have higher MBSR. The opposite trend was seen among those who scored low PSS scores. Here, among low PSS, lower scores of MBSR actually had the least amount of SRE among all participants. It appears that those who have the highest and the lowest amount of SRE both have low MBSR strategies. This finding may suggest that among manageable levels of stress (moderate to semi-high stress scores), MBSR is beneficial in helping to balance the effects of stressful circumstances but however, when stressful experiences happen too often or are constant and unwavering, the ability to continue practicing MBSR may become increasingly more difficult to maintain.

The second interaction effect suggested that, regardless of cognitive coping level, individuals who reported low MBSR had more stressful experiences overall across the past six months than those who reported high MBSR. Among the lowest scores of SRE were individuals of high MBSR and high cognitive coping capability, followed by high MBSR with low cognitive coping capability. This finding supports previous research on mindfulness and its beneficial effects on stress management. The individuals who scored the highest SRE were those who reported low MBSR and high cognitive coping. This trend suggests to the researchers that cognitive coping and mindfulness are similar and related but not the same. A mindful individual may or may not be heavily skilled in the strategies of stress reduction via interpersonal cognitive strategies but with extended use, it seems that cognitive coping capability rises with MBSR over time.

The importance of managing stress appropriately has become increasingly difficult to ignore in the modern

pandemic of COVID-19. With the promising effectiveness of MBSR seen in this study as well as numerous supportive scientific journals, it is becoming increasingly more necessary to incorporate into our daily lives. With so much opportunity for stressful experiences, why aren't more global citizens relying on the stress reduction of mindfulness? As we adapt and evolve our daily normal expectations to adapt for COVID-19, incorporating easy mindful practices is just another small change we all can begin to adjust to. Many times, the burden of global stressors seems to consume our mental space and time, giving the impression that we are controlled by our stress rather than being *in* control of it. One suggested future step is to consider MBSR curriculum in the changing public-school systems. Once more proactive and MBSR coping strategies are publicized and made popular, we will likely see a decrease in the amount of reported stress experienced across the globe.

#### **Acknowledgements**

Thank you to Dr. Jamila Newton and the entire Honors society. Grateful to SERCA for funding my research and the National Society of Leadership & Success for fostering my skills. Thank you to my family and to my friends who were still there when I emerged from under my pile of books. I love you all.

#### **References**

- [1] Cohen S, Kamarck T, & Mermelstein R. (1983) A Global Measure of Perceived Stress. *J Health Soc Behav.*,24(4):385–96.
- [2] Flor, H., & Nees, F. (2014). Learning, memory and brain plasticity in posttraumatic stress disorder: Context matters. *Restorative Neurology and Neuroscience*, 32(1), 95–102
- [3] Garnefski N., Legerstee J., Kraaij V., van den Kommer T., Teerds J. (2001). Cognitive coping strategies and symptoms of depression and anxiety: a comparison between adolescents and adults. *J. Adolescence* 25, 603–611. 10.1006/jado.2002.0507
- [4] Miao, Miao, Zheng, Lei, & Gan, Yiqun. (2017). Meaning in Life Promotes Proactive Coping via Positive Affect: A Daily Diary Study. *Journal of Happiness Studies*, 18(6), 1683–1696
- [5] Holmes, T, & Rahe, R. (2017). The Holmes–Rahe stress inventory. *Occupational Medicine*, 67(7), 581–582
- [6] Ridder, D. D. (2017, September 14). Questionnaires & Internal Reports. Retrieved November 09, 2020
- [7] Schroder, K. E. E., & Ollis, C. L. (2013). The Coping Competence Questionnaire: A measure of resilience to helplessness and depression. *Motivation and Emotion*, 37(2), 286–302
- [8] Southwick, S. M., & Charney, D. S. (2012). The Science of Resilience: Implications for the Prevention and Treatment of Depression. *Science*, 338(6103), 79–82. doi: 10.1126/science.1222942
- [9] Taylor, Steven, Landry, Caeleigh A, Paluszek, Michelle M, Fergus, Thomas A, McKay, Dean, & Asmundson, Gordon J.G. (2020). Development and initial validation of the COVID Stress Scales. *Journal of Anxiety Disorders*, 72, 102232–102232



# ABA Training via Telehealth for Caregivers of Children with Autism: A Review of the Literature

Elizabeth Luna

*B.A. Candidate, Department of Psychology, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

Received 14 May 2021; accepted 20 July 2021

---

## Abstract

The current COVID-19 circumstances have forced many of us to turn away from in-person consultations and receive virtual services instead, but are autistic children receiving the effective services they need during the COVID-19 pandemic? Applied Behavior Analysis (ABA) procedures have been used as an effective form of treatment for autistic children for many years and have been provided via telehealth even before the pandemic came along. The purpose of this review of literature was to investigate if ABA caregiver training via telehealth was an effective form of providing services to families of children with autism. We strived to focus on the functional analysis (FA) and functional communication training (FCT) portions of the caregiver training in ABA therapy. The population of interest for this review included children ages 2-12 diagnosed with autism spectrum disorder (ASD) and their caregivers. The findings of this study demonstrate that ABA therapy via telehealth was effective because it reduced problem behaviors and increased mands, it could be feasibly implemented with fidelity by caregivers, it was accessible, and it was highly rated by caregivers of children with autism.

*Keywords: functional communication training, telehealth, functional analysis, applied behavior analysis, parent training*

---

## Introduction

According to the Centers for Disease Control and Prevention (2020) data from 2016, 1 out of every 54 children in the U.S. is diagnosed with autism spectrum disorder (ASD). Some of the main difficulties that children with ASD struggle with include problematic behaviors such as aggression, self-injurious behaviors (SIB), property destruction, and noncompliance. However, there are treatments that have demonstrated to be effective in treating and helping reduce these problematic behaviors, some of which include applied behavior analysis (ABA). ABA therapy has been used by caregivers of children with autism for decades. These therapies include procedures such as functional analysis (FA) used to detect the function of behaviors, and functional communication training (FCT) which is an intervention used to help reduce the targeted problem behavior through the detection of the function of behavior in FA.

Although ABA therapy has shown to be an effective treatment for the challenging symptoms of children with autism, it may not be possible for all families to access these services. Therefore, recent research has studied telehealth as an alternative option for those families who perhaps live in a rural area or are too far away from clinics/hospitals in which ABA services can be provided. Furthermore, these studies have strived to examine the effectiveness of caregiver training via telehealth, specifically the fidelity of FA and FCT procedures implemented by the caregivers, and the caregivers' acceptability of treatment. As a result, caregiver training via telehealth provided by behavior consultants may be a promising option available to those with limited access to ABA services.

According to McLeod's (2018) article on B.F. Skinner's operant conditioning theory, an individual makes an association between a behavior and a consequence. The operant conditioning theory argues that behaviors that are reinforced are more likely to occur, and behaviors that are

not reinforced are less likely to occur (Skinner, 1938). In his famous "Skinner Box" experiment, Skinner demonstrated that rats learned and repeated behaviors that had been reinforced by a rewarding consequence (food), this is known as positive reinforcement. The rats in Skinner's studies also learned and repeated behaviors that had previously resulted in the removal of an unwanted stimulus (electric shock), also known as negative reinforcement (Skinner, 1938; McLeod, 2018). Similarly, applied behavior analysis uses reinforcement and rewards to strengthen desired behaviors and removes them to make undesired behaviors less likely.

During ABA therapies' caregivers are taught to reward their children's positive behavior by providing some type of reinforcement, and not rewarding the unwanted behaviors. Similar to the ABA therapies used to train the caregivers of children with autism, B.F. Skinner's (1938) operant conditioning experiment gives us a better understanding of the connection someone makes between a behavior and a consequence as well as the power of reinforcement on behavior. However, it is important to note that much of the learned behaviors in Skinner's experiment could have been due to the rats' enclosure in the box and their inability to escape. In addition, Shrestha (2017) reports that the operant conditioning learning theory fails to acknowledge the "mental thoughts and cognitive factors that influence learning, memory and behavior." Some suggest that the rats' behaviors cannot be representative of the way humans would behave due to the differences in physiology and anatomy between the two.

Other theories, such as Bandura's (1977) Social Learning Theory acknowledges the importance a social context has on a person's behavior. His theory focused on the process of observational learning. Unlike Skinner, Bandura's theory highlighted the cognitive factors that took place during the learning process. Bandura believed that humans actively process information and consider the consequences of their behaviors (Bandura, 1977). In 1986, Bandura renamed his

theory, Social Cognitive Theory. Bandura proposed four mediational processes: attention, retention, reproduction, and motivation, which explained the mental events that take place before any imitation of behavior occurs (Bandura, 1986). Although Bandura's theory acknowledges the existence of the mental processes that take place when deciding whether to imitate a behavior or not, McLeod (2016) states that it fails to identify behavior through the interaction of both nature (biology) and nurture (environment). In addition, it cannot fully explain humans' thoughts and feelings processes. Therefore, it fails to provide a complete interpretation of behavior. Keeping these general theoretical approaches in mind, we would like to dive into the more recent and specific research studies analyzed for this review regarding ABA training via telehealth.

### Literature Review

Wacker et al. (2012) examined the effectiveness of ABA caregiver training via telehealth. Their study included 17 caregivers of children with ASD who conducted functional assessments and functional communication training via telehealth in order to reduce problem behaviors. The problem behaviors identified by the caregivers in this study include aggression, self-injury, property destruction, screaming, elopement, repetitive behavior, dangerous behavior, and task refusal. Amongst the 17 children, a total of 19 FCT treatments were implemented (Wacker et al., 2012). The researchers' findings indicate that 93.5% of targeted problem behaviors decreased. In the caregiver acceptability survey completed by the caregivers, they rated the telehealth services as highly acceptable (Wacker et al., 2012). In addition, Wacker et al. (2012) compared the costs of in vivo and telehealth services to conduct FAs and FCTs and determined that telehealth services were relatively cheaper than in vivo sessions.

Recent research, such as Tsami et al. (2019) have demonstrated the effectiveness of providing behavior analysis services and caregiver training via telehealth in other countries (outside of the U.S.). The researchers' findings indicate that both functional assessment (FA) and functional communication training (FCT) provided to caregivers of children with autism via telehealth was successful. Through the help of interpreters to assist the caregivers' and the therapists' communication while implementing FA and FCT, they were able to decrease problematic behaviors such as screaming, aggression, self-injury, flopping, and property destruction, by at least 80% in all of the 12 children who remained in their study (Tsami et al., 2019). In addition, the 12 caregivers in the study rated the telehealth services by completing an acceptability survey, which was also completed by 13 caregivers in the U.S. who received telehealth services during this time by the same therapist. The results of their study indicate that caregivers were overall satisfied with the procedures and their ratings were similar to the caregivers who received telehealth services in the U.S. Therefore, the findings from Tsami et al. (2019) indicate that FA and FCT via telehealth can be successfully applied even if there are cultural differences or communication barriers present.

Furthermore, a study conducted by researchers Benson et

al. (2018) coached the caregivers of two boys with developmental disabilities via telehealth by using FA and FCT in order to reduce self-injurious behaviors (SIB). One of the boys was an 8-year-old with cerebral palsy, and the other was a 5-year-old with ASD. The coach was a graduate student in Educational Psychology with 3 years of experience in implementing FA and FCT procedures. Using an ABAB design, the baseline (FA) and intervention (FCT) were conducted by each of the boys' caregivers while following the instructions of the coach via telehealth (Benson et al., 2018). Their results showed a caregiver fidelity of 99% across FCT conditions for one of the boys, and 88% for the other. Although the correct implementation of FA procedures ranged from 33% to 100% (Benson et al., 2018) a great majority of the FA conditions demonstrated above 80% fidelity. In addition, the results from Benson et al. (2018) demonstrated that the rate of SIB of the two boys decreased to zero or nearly zero in the final conditions.

One of the most recent studies, Lindgren et al. (2020) included 38 children with ASD (ages 21-84 months) in which FA and FCT was implemented via telehealth. Caregivers conducted all FA and FCT procedures in their homes with the help of coaching from behavioral consultants via telehealth (Lindgren et al., 2020). The problematic behaviors in this study were self-injurious behavior, aggressive behaviors, verbal outburst, and noncompliance. Through a randomized control trial, Lindgren et al. (2020) randomly assigned participants into either a control group which received delayed intervention (FCT), or the immediate group which received immediate FCT intervention. Their results demonstrated that caregiver implemented FCT via telehealth provided better results in problem behavior reduction than the intervention "as usual" group (Lindgren et al., 2020). However, once FCT treatments were introduced to the "delayed" intervention group, the control group's problem behaviors also significantly declined. Lastly, the caregivers' acceptability was also taken into account by using a 7-point Likert scale post hoc in which the caregivers indicated their high acceptability for the FCT procedures they had learned and implemented via telehealth (Lindgren et al., 2020).

Likewise, Suess et al. (2014) found that functional communication training via telehealth reduced problem behaviors across all three of their participants. Their findings show that telehealth can be an effective and beneficial resource for caregivers of children with autism in rural areas. Furthermore, Suess et al. (2014) studied the treatment fidelity of the caregiver's implementation of the FA and FCT procedures in which caregivers recorded themselves during independent sessions. During these independent sessions, caregivers were given specific steps to follow in order to correctly apply FCT procedures. After each video was submitted, a coaching session was provided by the behavior consultant. In addition, the behavior consultant gave feedback to the caregivers based on the errors or correctly implemented steps seen in the recordings (Suess et al., 2014). Similarly, caregiver acceptability of treatment via telehealth was highly rated (Suess et al., 2014).

Preliminary evidence found by Suess et al. (2016), suggests that all participants showed a reduction in problem

behaviors of 50% or more, 65.1% on average, with FA and FCT procedures implemented while using telehealth services. In their study behavior consultants trained the caregivers of 5 children with ASD on FA and FCT procedures during a 1-hr FA visit and three 15-min FCT visits. The purpose of their study was to demonstrate the effectiveness of FA and FCT procedures via telehealth while decreasing the amount of time needed in training caregivers (Suess et al., 2016). The researchers strived to demonstrate that ABA services through telehealth are effective and available to families sooner than the typical wait time of six months, for access to these services (Suess et al., 2016).

However, a single-case analysis conducted by Schieltz et al. (2018) found that caregiver training in FA and FCT procedures via telehealth is not always successful in reducing problem behaviors. Schieltz et al. (2018) focused on two participants, Liam and Sara, from a previous study (Lindgren & Wacker, 2011) in which FCT procedures via telehealth were unsuccessful at decreasing problem behaviors. The purpose of their study was to determine why FA and FCT failed in these two cases and to examine the fidelity with which the procedures were implemented. Through the use of establishing operations and reinforcement analysis, the researchers reanalyzed the cases and found that Liam's problem behavior was maintained first by social reinforcers but then switched to automatic reinforcement (Schieltz et al., 2018). Whereas Sara's problem behavior was also maintained by social reinforcers but showed high variability in manding and task completion during FCT (Schieltz et al., 2018). In addition, the fidelity of the behavior consultants in their study was 100%, 96% for Liam's mother, and only 45% fidelity was recorded for Sara's mother. Thus, suggesting that low fidelity could have been what impacted Sara's results during FCT (Schieltz et al., 2018).

Further inspection by Wacker et al. (2013) suggests that FAs can be conducted effectively with little training time and it is a cost-effective alternative to in-person consultations. Two behavior consultants in their study trained the caregiver assistants and caregivers of 20 children with ASD (ages 29-80 months) on FA procedures via telehealth. The total training time via telehealth of caregivers, caregiver assistants, and consultants' time, took approximately 4 hours per participant. The weekly costs of telehealth services were \$57.95, rather than \$335.09 if the services were provided in person (Wacker et al., 2013). Furthermore, their findings demonstrated a successful and cost-effective means for reducing problem behavior in all participants, after FCT interventions were matched to the FA results (Wacker et al., 2013).

Moreover, a study by Machalicek et al. (2016) trained the caregivers of three school-aged children with ASD through teleconferencing. The caregivers of the children in Machalicek et al. (2016) were trained to effectively implement functional analyses, functional communication training, antecedent manipulation strategies, and consequence-based strategies. Caregivers in their study were allowed to try and select the intervention that best fit their family needs. Additionally, a social validity questionnaire was given to the caregivers to determine the acceptability, effectiveness, and disadvantages of the

interventions (Machalicek et al., 2016). Their findings indicate that caregiver training in intervention strategies via telehealth was an effective way to reduce challenging behaviors of all of their participants with ASD (Machalicek et al., 2016).

Unlike most studies, which tend to focus on FA and FCT procedures via telehealth for decreasing challenging behaviors, Simacek et al. (2017) chose to focus on communication interventions for children with neurodevelopmental disabilities. Their study included three young females (ages 3.5-4 years old), two with ASD and one with Rett syndrome, and their caregivers. A functional assessment interview (FAI), a structured descriptive assessment (SDA), and a multi element probe design (MPD) was used in this study (Simacek et al., 2017). The researchers trained caregivers to conduct FA and FCT procedures via telehealth with the goal of decreasing idiosyncratic responses (difficult to interpret responses such as reaching or tantrums) and increasing augmentative and alternative communication (AAC) in order to provide the participants with a more broadly understood form of communication. Simacek et al. (2017) findings indicated that communication interventions via telehealth were effective and highly acceptable by the caregivers through the use of a modified version of the Treatment Acceptability Rating Form-Revised (TARF-R; Reimers and Wacker 1988; Reimers et al. 1981).

The purpose of the current review of literature is to analyze the existing research on the use of telehealth services to deliver ABA caregiver training and therapy to children with autism. Additionally, we want to examine the fidelity and feasibility with which caregivers are able to implement the FA and FCT procedures. But will ABA caregiver training via telehealth be truly effective in reducing problem behaviors in children with autism? Will the FA and FCT procedures be implemented with fidelity by the caregivers? Based on my research questions, I hypothesize that caregivers who receive ABA caregiver training via telehealth in FA and FCT procedures will effectively reduce problem behaviors of their children with ASD. In addition, I hypothesize that the FA and FCT procedures will be implemented with fidelity and rated as acceptable by the caregivers.

## **Methods**

### *Participants*

For this literature review, there was a particular interest in studies focused on children with autism and their caregivers. A total of 105 children with ASD and their families participated in the selected studies for this review. The target age range of interest for this literature review was children with autism ages 2-12 years old and their caregivers (see Table 1). The level of education of the caregivers was expected to vary greatly. In addition, these studies focused on ABA therapists who were using telehealth services to provide therapy and training. Likewise, the levels of education and experience of each ABA therapist was expected to differ (see Table 2).

### *Materials*

The articles that were selected for this review of literature

were collected through a series of steps to ensure a high-quality evaluation of the effectiveness of ABA telehealth services used for caregiver training of children with autism. In addition to the use of the University Library OneSearch engine, some of the key databases that were searched for this review of literature include EBSCOhost, Academic Search Premier, PsycINFO, ScienceDirect, and Google Scholar. These searches aimed to find peer-reviewed journals relevant to the topic of ABA therapy, telehealth education, and ABA training for caregivers of children with autism. Important educational journals in which these articles were published were analyzed independently and included in this review. Academic journals such as the *Journal of Applied Behavior Analysis*, *Behavior Analysis in Practice*, *Journal of Autism and Developmental Disorders*, *Journal of Educational and Psychological Consultation*, *Research in Autism Spectrum Disorders*, *Behavioral Interventions*, *Behavior Analysis: Research and Practice*, *Journal of Developmental and Physical Disabilities*, were all considered significant and possible contributors for this review.

#### *Procedure*

First, a wide search was made in each of the previously mentioned databases using the following keywords: *autism spectrum disorder*, *applied behavior analysis*, *ABA therapy*, *telehealth*, *telecommunication*, *telemedicine*, *parent training*, *caregiver training*, *virtual-training*, *functional analysis*, *functional communication training*, and *ABA interventions*. Next, a filter was applied to each of the database searches in order to ensure only peer-reviewed articles published from 2010 to 2020 were located for future examination. Lastly, the reference section of each article was considered in order to obtain more articles relevant to the topic of interest. Through the use of this search method, a minimum of 10 studies were selected and analyzed in which different areas of focus were evaluated including the effectiveness of telehealth consultations, the use of ABA therapy, behavior analytic interventions, autism caregiver training, and functional communication training via telehealth.

All of the studies were individually inspected based on the following components: child participant age range and diagnosis, caregiver implementing procedures, caregiver level of education, consultant's level of education/experience, additional caregiver assistance provided, child and caregiver location, type of ABA procedure implemented, target behaviors, caregiver

treatment acceptability rating, and the impact of telehealth services on behaviors of the participants. The system of methods utilized by these studies during their collection of data, such as the use of surveys, learning outcomes, or descriptive data, was noted.

#### *Design*

For this review of the literature, past research on the topic of caregiver training via ABA telehealth services was reviewed in order to obtain a better understanding and ultimately be able to apply the results of significant studies to ABA practice. Therefore, a thorough review process was implemented.

A meta-analysis was not conducted because elements such as the methods for data collection, areas of focus, and type of telehealth service providers used, differed significantly amongst the studies. In addition, the reliability and validity of the studies was not always reported. Therefore, the accuracy and exactness necessary for a meta-analysis was not present.

#### **Results**

Based on the results of previous studies (Benson et al. 2018; Lindgren et al. 2020; Machalicek et al. 2016; Schieltz et al. 2018; Simacek et al. 2017; Suess et al. 2014; Suess et al. 2016; Tsami et al. 2014; Wacker et al. 2012; Wacker et al. 2013), we expected to find a high percentage of caregivers' acceptability of FA and FCT procedures via telehealth. Although not all studies reported caregiver acceptability ratings, the studies that did showed that caregivers considered the treatment via telehealth as highly acceptable (see Table 3). We also expected to find a decrease in problematic behaviors across all participants (children with autism) in this review. As expected, the current review of literature demonstrated a decrease in problematic behaviors across most of the examined studies (see Table 3). In addition, the fidelity of caregiver applied FA and FCT procedures were expected to be at elevated levels. Likewise, the feasibility of caregiver training, provided by behavior consultants, on FA and FCT procedures were expected to be relevant and applicable. Although not all of the variables were addressed in all of the studies chosen for this review, the majority of studies demonstrated high fidelity, feasibility, and acceptability of caregiver training in FA and FCT procedures via telehealth (see Table 3). In addition, the location of the behavior consultants and the families of the children receiving treatment were also noted (see Table 2).

**Table 1**  
*Participant Demographic Information*

| Study                | Participants | Ages         | Diagnosis | Caregiver Implementing Procedures | Caregiver Level of Education           |
|----------------------|--------------|--------------|-----------|-----------------------------------|--|
| Wacker et al. (2012) | 17 children  | 29-83 months | ASD       | 16 mothers, 2 fathers             | Some level of post-secondary education |

**Table 1**  
*Continued*

| Study                    | Participants | Ages            | Diagnosis                    | Caregiver Implementing Procedures | Caregiver Level of Education                           |
|--------------------------|--------------|-----------------|------------------------------|-----------------------------------|--|
| Wacker et al. (2013)     | 20 children  | 29-80 months    | ASD                          | 19 mothers, 1 father              | Most had a degree beyond high school                   |
| Suess et al. (2014)      | 3 children   | 2.7-3.3 years   | ASD                          | 3 caregivers                      | Ranged from high school to doctoral degree             |
| Machalicek et al. (2016) | 3 children   | 8-16 years      | ASD                          | 2 mothers, 1 father,              | Ranged from high school to bachelor's degree           |
| Suess et al. (2016)      | 5 children   | 2.5-7.1 years   | ASD                          | Caregivers                        | Not found  |
| Simacek et al. (2017)    | 3 children   | 3.5-4 years     | ASD (1)<br>Rett Syndrome (2) | 3 mothers, 2 fathers              | Not found  |
| Benson et al. (2018)     | 2 children   | 5-8 years       | ASD or Cerebral Palsy        | Caregivers                        | Not found  |
| Schieltz et al. (2018)   | 2 children   | 2.10-6.11 years | ASD                          | 2 mothers                         | Ranged from some college experience to master's degree |
| Tsami et al. (2019)      | 12 children  | 3-13 years      | ASD                          | 10 mothers, 1 father, 1 brother   | 10 out of 12 had college degrees                       |
| Lindgren et al. (2020)   | 38 children  | 21-84 months    | ASD                          | Caregivers                        | Not found  |

*Note.* ASD = autism spectrum disorder.

**Table 2**  
*Telehealth Consultations Information*

| Study                | Consultants Location   | Consultants Providing Coaching                    | Consultant's Level of Education/ Experience                                  | Additional Caregiver Assistance Provided | Child and Caregiver Location   |
|----------------------|--|---|--|--|--|
| Wacker et al. (2012) | University of Iowa Children's Hospital (about 222 miles from regional clinics) | 2 behavior consultants, 1 senior behavior analyst | Behavior consultants unknown, BCBA 20 years                                  | Caregiver assistants available           | Child Health Specialty Clinics (within 15 miles from family's homes) |
| Wacker et al. (2013) | University of Iowa Children's Hospital (about 222 miles from regional clinics) | 2 behavior consultants                            | 4-9 years of experience One w/bachelor's degree, and one doctoral candidate. | Caregiver assistants available           | Child Health Specialty Clinics (within 15 miles from family's homes) |
| Suess et al. (2014)  | Telehealth Center at University of Iowa Children's Hospital                    | 1 behavior consultant                             | Doctoral student with 6 years' experience                                    | None                                     | Family's Home  |

| <b>Study</b>             | <b>Consultants Location</b>                                 | <b>Consultants Providing Coaching</b> | <b>Consultant's Level of Education/ Experience</b> | <b>Additional Caregiver Assistance Provided</b> | <b>Child and Caregiver Location</b>                            |
|--------------------------|---|---------------------------------------|--|---|--|
| Machalicek et al. (2016) | Private university office                                   | 1 behavior consultant                 | BCBA-D with PhD in Special Education               | None  | Family's Home  |
| Suess et al. (2016)      | Telehealth Center at University of Iowa Children's Hospital | 3 behavior consultants                | Doctoral students with 5-8 years' experience       | Caregiver assistants available                  | Therapy room at a regional autism center (177 miles from UICH) |

**Table 2**  
Continued

| <b>Study</b>           | <b>Consultants Location</b>                                 | <b>Consultants Providing Coaching</b> | <b>Consultant's Level of Education/ Experience</b>   | <b>Additional Caregiver Assistance Provided</b> | <b>Child and Caregiver Location</b>                 |
|------------------------|---|---------------------------------------|--|---|---|
| Simacek et al. (2017)  | Telepresence Behavior Lab (TBL)                             | Behavior consultants                  | Unknown  | None  | Family's Home                                       |
| Benson et al. (2018)   | Tele Behaviour Lab at the University of Minnesota           | Behavior consultants                  | Graduate student in Educational Psychology with 3 years' experience provided direct caregiver-coaching | None  | Family's Home                                       |
| Schieltz et al. (2018) | Telehealth Center at University of Iowa Children's Hospital | Behavior consultant                   | Unknown  | None  | Family's Home (64-296 miles from telehealth center) |
| Tsami et al. (2019)    | Office at a Houston, TX university                          | 2 behavior consultants                | Unknown  | Interpreters                                    | Family's Home (Internationally)                     |
| Lindgren et al. (2020) | Telehealth Center at University of Iowa Children's Hospital | Behavior consultants                  | Behavior analyst or advanced graduate trainees with at least 2 years' experience                       | None  | Family's Home                                       |

*Note.* BCBA = board certified behavior analyst.

**Table 3**  
*Caregiver Training in ABA Procedures via Telehealth*

| Study                    | Type of ABA procedure         | Target Behaviors  | Results   | Treatment Acceptability   |
|--------------------------|-------------------------------|---|---|---|
| Wacker et al. (2012)     | FA + FCT                      | Problem behaviors: aggression, self-injury, destruction, and disruption   | 93.5% reduction in problem behavior   | Not reported  |
| Wacker et al. (2013)     | FA                            | Problem behaviors: aggression, property destruction, self-injury, disruption, dangerous behavior, and repetitive movements  | 90% identified social function during initial FA  | Not reported  |
| Suess et al. (2014)      | FCT                           | Problem behaviors: SIB, aggression, and property destruction  | All participants demonstrated significant reductions in problem behaviors   | Rated as highly acceptable by caregivers (TARF-R)   |
| Machalicek et al. (2016) | FA + Function-based treatment | Challenging behaviors: aggression, inappropriate vocalizations, SIB, material destruction, and spitting   | Decreased challenging behaviors for each participant  | Mean rating of 5.22 on a 6-point Likert scale   |
| Suess et al. (2016)      | FA+FCT                        | Problem behaviors: aggression, destruction, SIB, and crying   | Identified social functions for most participants, on average problem behaviors reduced by 65.1%, task completion increased by 34.3% and by 87.5% for manding | Not reported  |
| Simacek et al. (2017)    | FA+FCT                        | Communication skills: identifying idiosyncratic responses (difficult to interpret responses such as reaching or crying/tantrums) and reinforcing augmentative and alternative communication | Idiosyncratic responses decreased and AAC responses were obtained by participants. FA and FCT procedures were implemented successfully by caregivers.         | Rated as highly acceptable by caregivers with an average score 6.91 on a 7-point Likert scale |

**Table 3**  
 Continued

| Study                  | Type of ABA procedure | Target Behaviors  | Results  | Treatment Acceptability   |
|------------------------|-----------------------|---|--|---|
| Benson et al. (2018)   | FA + FCT              | Problem behavior: Self-injurious behaviors  | Decrease in self-injurious behaviors and increase in mands. Treatment implemented with 95% fidelity by caregivers.   | Not reported  |
| Schieltz et al. (2018) | FA + FCT              | Problem behaviors: SIB, aggression, and property destruction  | Results were unsuccessful in the host-study, after reanalysis the current study behavior function switch was detected for one participant, and poor caregiver fidelity was detected for the other. | Not reported  |
| Tsami et al. (2019)    | FA + FCT              | Problem behaviors: self-injury, screaming, aggression, property destruction, and flopping           | Reduced problem behaviors by at least 80% and increased manding to 90%   | Rated acceptable and effective by caregivers internationally                    |
| Lindgren et al. (2020) | FA + FCT              | Problem behaviors: SIB, aggression, property destruction, verbal outburst, and severe noncompliance | Problem behaviors reduced by an average of 97% after completing FCT treatment  | Caregivers' acceptance rate using the TARF-R 7-point Likert scale averaged 6.30 |

*Note.* FA = functional assessment; FCT = functional communication training; SIB = self-injurious behavior; TARF-R = Treatment Acceptability Rating Form-Revised; AAC = augmentative and alternative communication.

## Discussion

Clearly, this topic is important to study because many children with ASD and their families can continue to have access to ABA services via telehealth throughout the current COVID-19 circumstances. Additionally, families who do not already have access to ABA services, due to living in rural areas in which ABA services are scarce, can benefit from telehealth. Our findings can contribute to the suggestions of the effectiveness of caregiver training in FA and FCT procedures to help reduce problem behaviors in children with autism. In addition, we can bring awareness to the lack of access to ABA services in disadvantaged areas, in which poverty is present, and the possible limitations of access to appropriate internet services needed for telehealth services. Most importantly, children in need of ABA intervention and their caregivers will have the opportunity to learn how to reduce problem behaviors that may interfere with their daily living tasks in order to increase the benefits received from both educational and social settings. Due to the majority of the aforementioned studies focusing on decreasing problem behaviors in children with autism, further research is needed in caregiver training via telehealth on skill acquisition. Furthermore, there is a high need in research focusing on children learning through virtual formats, in general, as a result of the recent changes that COVID-19 has brought about. There is also a need to identify which type of learners will benefit most from virtual formats such as telehealth.

Furthermore, limitations of the studies selected for this review include that caregivers in the studies reported a higher level of education ranging from high school diploma to PhD. Therefore, future research should look at the effect of caregiver level of education on the effectiveness of implementation of FA and FCT procedures via telehealth. Although this review of literature on telehealth services seems to be an effective way of providing training for the caregivers of children with ASD, there are also technological issues that may arise during telehealth sessions. Lee et al. (2014) addressed technical problems and troubleshooting methods in an attempt to try and make ABA sessions via telehealth more productive. Lee et al. (2014) provided step-by-step support for providers such as IT support and troubleshooting for a delay in audio (or missing audio), video-transmission, and webcam issues. Their study contributes to the ABA telehealth support needed during the drastic increase in virtual communication that the recent COVID-19 pandemic has brought about. Lee et al. (2014) is one of the few studies that have examined the technological issues that may arise during telehealth consultations, therefore more research is needed on this topic to determine the effects of technical problems on the results of ABA training via telehealth.

In the end, this study brings light to the many difficulties that caregivers of children with autism may face when trying to obtain ABA services such as, living in rural areas away from clinics/providers, the international shortage of BCBA's, the language barriers that can possibly impede in service quality or understanding, and the challenges that children with problem behaviors may face on a daily basis. However, the children, caregivers, and behavior consultants in these

studies found a way to conquer these challenges and complete the treatments successfully via telehealth. By reducing challenging behaviors while also finding a possible solution to delivering previously inaccessible services, caregivers of children with autism can help increase their child's quality of life.

## Acknowledgements

This work was possible due to the contributions of the California State University, Stanislaus, Professor of Psychology Dr. Katie M. Wiskow. Thank you Dr. Wiskow for your continuous support and mentorship. I would also like to thank Professor Suditi Gupta, Research Librarian Tim Held, and Professor Jamila Newton for their feedback and guidance on this research project.

## References

- [1] Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall, Inc.
- [2] Bandura, A. (1977). *Social learning theory*. Englewood Cliffs, NJ: Prentice Hall.
- [3] Benson, S. S., Dimian, A. F., Elmquist, M., Simacek, J., McComas, J. J., & Symons, F. J. (2018). Coaching parents to assess and treat self-injurious behaviour via telehealth. *Journal of Intellectual Disability Research*, 62(12), 1114–1123. DOI: 10.1111/jir.12456
- [4] Centers for Disease Control and Prevention (CDC). (2020). *Data & statistics on autism spectrum disorder*. Retrieved from [www.cdc.gov/ncbddd/autism/data.html](http://www.cdc.gov/ncbddd/autism/data.html).
- [5] Lee, J. F., Schieltz, K. M., Suess, A. N., Wacker, D. P., Romani, P. W., Lindgren, S. D., Kopelman, T. G., & Padilla Dalmau, Y. C. (2015). Guidelines for developing telehealth services and troubleshooting problems with telehealth technology when coaching parents to conduct functional analyses and functional communication training in their homes. *Behavior Analysis in Practice*, 8(2), 190–200. DOI: 10.1007/s40617-014-0031-2
- [6] Lindgren, S., Wacker, D., Schieltz, K., Suess, A., Pelzel, K., Kopelman, T., Lee, J., Romani, P., & O'Brien, M. (2020). A randomized controlled trial of functional communication training via telehealth for young children with autism spectrum disorder. *Journal of Autism and Developmental Disorders*. DOI: 10.1007/s10803-020-04451-1
- [7] Machalicek, W., Lequia, J., Pinkelman, S., Knowles, C., Raulston, T., Davis, T., & Alresheed, F. (2016). Behavioral telehealth consultation with families of children with autism spectrum disorder. *Behavioral Interventions*, 31(3), 223–250. <https://doi.org/10.1002/bin.1450>
- [8] McLeod, S. A. (2018, January 21). *Skinner - operant*



- conditioning*. Simply Psychology. Retrieved from <https://www.simplypsychology.org/operant-conditioning.html>.
- [9] McLeod, S. A. (2016, February 05). *Bandura - social learning theory*. Simply Psychology. <https://www.simplypsychology.org/bandura.html>.
- [10] Reimers, T. M., & Wacker, D. P. (1988). Parents' ratings of the acceptability of behavioral treatment recommendations made in an outpatient clinic: A preliminary analysis of the influence of treatment effectiveness. *Behavioral Disorders*, 14, 7–15. <http://www.jstor.org/stable/23886135>.
- [11] Reimers, T. M., Wacker, D. P., & Cooper, L. J. (1991). Evaluation of the acceptability of treatments for children's behavioral difficulties: Ratings by parents receiving services in an outpatient clinic. *Child & Family Behavior Therapy*, 13, 53–71.
- [12] Schieltz, K. M., Romani, P. W., Wacker, D. P., Suess, A. N., Huang, P., Berg, W. K., Lindgren, S. D., & Kopelman, T. G. (2018). Single-case analysis to determine reasons for failure of behavioral treatment via telehealth. *Remedial and Special Education*, 39(2), 95–105. <https://doi.org/10.1177/0741932517743791>
- [13] Shrestha, P. (2017, November 17). *Operant conditioning*. Psychestudy. Retrieved from <https://www.psychestudy.com/behavioral/learning-memory/operant-conditioning>.
- [14] Simacek, J., Dimian, A. F., & McComas, J. J. (2017). Communication intervention for young children with severe neurodevelopmental disabilities via telehealth. *Journal of Autism and Developmental Disorders*, 47(3), 744–767. <https://doi.org/10.1007/s10803-016-3006-z>
- [15] Skinner, B. F. (1938). *The behavior of organisms: An experimental analysis*. New York: Appleton-Century.
- [16] Suess, A., Romani, P., Wacker, D., Dyson, S., Kuhle, J., Lee, J., Lindgren, S., Kopelman, T., Pelzel, K., & Waldron, D. (2014). Evaluating the treatment fidelity of parents who conduct in-home functional communication training with coaching via telehealth. *Journal of Behavioral Education*, 23(1), 34–59. DOI: 10.1007/s10864-013-9183-3
- [17] Suess, A. N., Wacker, D. P., Schwartz, J. E., Lustig, N., & Detrick, J. (2016). Preliminary evidence on the use of telehealth in an outpatient behavior clinic. *Journal of Applied Behavior Analysis*, 49(3), 686–692. <https://doi.org/10.1002/jaba.305>
- [18] Tsami, L., Lerman, D., & Toper-Korkmaz, O. (2019). Effectiveness and acceptability of parent training via telehealth among families around the world. *Journal of Applied Behavior Analysis*, 52(4), 1113–1129. DOI: 10.1002/jaba.645
- [19] Wacker, D. P., Lee, J. F., Padilla Dalmau, Y. C., Kopelman, T. G., Lindgren, S. D., Kuhle, J., Pelzel, K. E., Dyson, S., Schieltz, K. M., & Waldron, D. B. (2012). Conducting functional communication training via telehealth to reduce the problem behavior of young children with autism. *Journal of Developmental and Physical Disabilities*, 25(1), 35–48. DOI: 10.1007/s10882-012-9314-0
- [20] Wacker, D. P., Lee, J. F., Padilla Dalmau, Y. C., Kopelman, T. G., Lindgren, S. D., Kuhle, J., Pelzel, K. E., & Waldron, D. B. (2013). Conducting functional analyses of problem behavior via telehealth. *Journal of Applied Behavior Analysis*, 46(1), 31–46. <https://doi.org/10.1002/jaba.29>

# Modesto's Housing Problem: Growing Population, High Cost, Difficulties in Obtaining Building Permits and Less Construction

Abdulla Mammadsoy

*B.S. Candidate, Department of Computer Science and Mathematics, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

Received 16 April 2021, accepted 20 July 2021

---

## Abstract

This paper investigates Modesto's housing problem, change in housing prices and cost of rent by analyzing data on key factors that cause the imbalance between supply and demand in housing market. The key factors that cause imbalance and affect the change in housing prices and cost of rent are population growth, the process of obtaining building permits, construction, and number of housing units available for living in Modesto. The difficulties in obtaining building permits and limited construction of new dwellings creates housing shortage and Modesto fails to meet the demand of its growing population. As a result, the housing prices and cost of rent increases rapidly, adding additional value to already increasing state-wide home value and cost of rent.

---

## Introduction

The housing problem in Modesto exists for years and it causes the increase in housing prices and cost of rent. The limited number of housing units available for living makes it difficult for people to find affordable housing. Housing shortage becomes worse year after year. The cost increases rapidly while construction of new dwellings lags. Soydemir (2019) mentioned that Central Valley has expensive permit fees and the process of obtaining a permit takes time. The expensive permit fees and the long-lasting process of granting such permits does not help to expand construction of new dwellings.

Previous research and publications show that the expensive permit fees and the difficulties in obtaining building permits have become a barrier for many residents. "The number of permits issued last year was 38 percent below the total in 2005" (Carlson, 2019). The low number of permits also indicates the lagging construction. "Construction of new housing has nearly stopped in Modesto, as the number of foreclosed and for-sale homes has decreased the demand for new housing units." (City of Modesto Analysis of Impediments to Fair Housing) This means each year the construction of new houses decreases while the population of Modesto (and Stanislaus county) growth rapidly. Carlson (2019) compares the population growth in Modesto to the number of housing units. Huge imbalance means rapid increase in cost. Cost of rent increases as well. "The average apartment rent has risen by 53 percent over five years, contributing to homelessness and a sense of despair among many residents." (Carlson, *'Can't afford to move, can't afford to stay': Spike in housing costs has many stuck*)

(Carlson, 2019) writes: "New housing in Modesto did not keep pace with population growth in the past decade. Based on normal occupancy of 2.80 people per dwelling, the city needed 4,350 new housing units, five times more than what was built. Since 2011, population has grown by 12,209 but the number of dwellings has grown by only 791". (Carlson, 2019) This means that population growth outpaces the building units available for living.

The limited number of already existing housing units and lagging construction of new dwellings do not handle the rapidly growing population. In other words, the city of Modesto becomes not capable of fitting its growing population and new residents. "The demand for housing in Modesto and the undersupply of dwellings are primary reasons for a 53 percent increase in average apartment rents since December 2013." (Carlson *Why so few places to live in Modesto? A clue. It has to do with raging economy.*)

## Methods

This research will use data from Bureau of Labor Statistics, U.S. Census Bureau, The Federal Housing Finance Agency and World Population Review. The further processing of obtained information, data analysis and visualization will help us to compare data on the next key factors important for this research: population growth, construction, change in housing price, and granted building permits. Using this data serves to investigate and demonstrate how easing the process of obtaining building permits by policymakers and expanding construction of new units may help to satisfy the demand of growing population in housing. Balancing the supply and demand should lower the housing prices and contribute into solution of the housing problem in Modesto (and Stanislaus county).

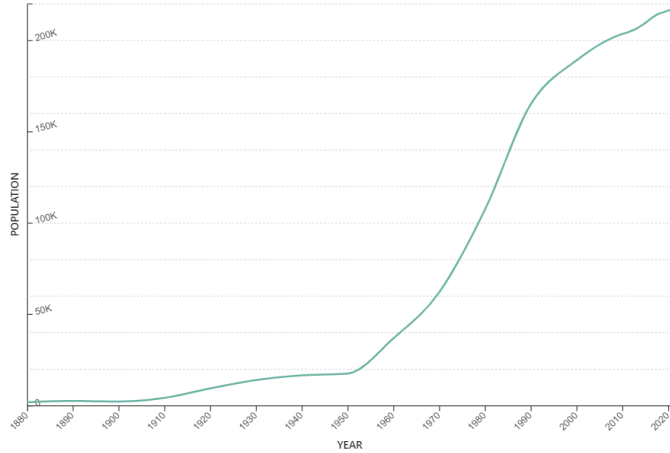
### *Population Growth*

Population growth is observed by retrieving information from "World Population Review". The change in number of Modesto's residents indicates the growth in population. The goal is to determine rate of Modesto's rapidly growing population. The population growth directly affects housing prices since it causes imbalance between supply and demand in housing market. "World Population Review" indicates the 2020 growth rate as 0.37%, growth since 2010 - 7.78%. (Modesto, California Population 2021) Modesto has welcomed 1389 residents in 2018, 1769 – in 2017, 1986 – in 2016 (0.95% annual growth rate) and so on. (Modesto, California Population

2021)

Modesto, California Population 2021

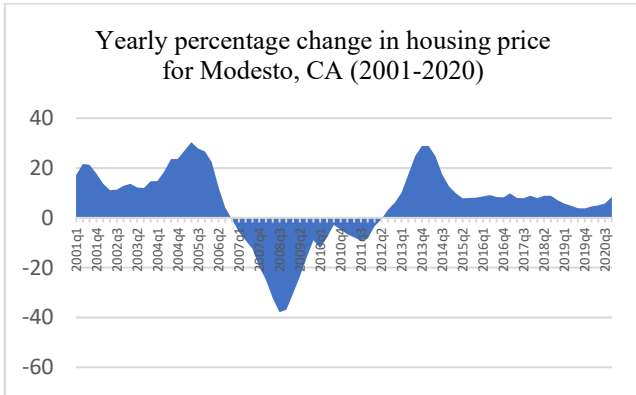
216,810



Graph 1. "Modesto, California Population 2021."

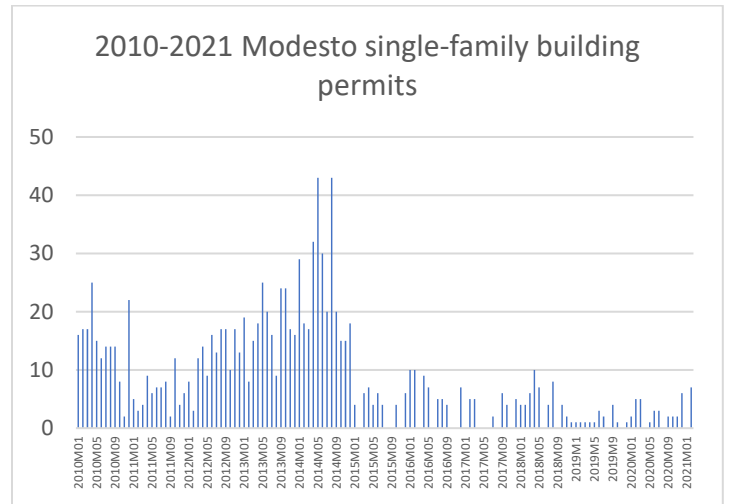
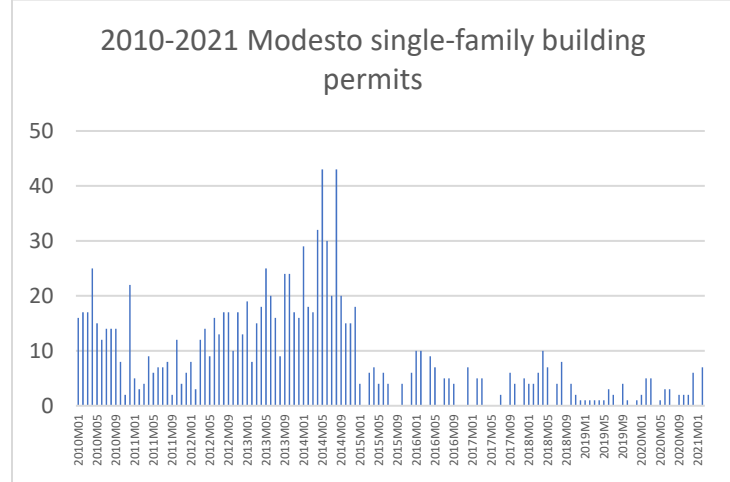
Changes in Housing Prices

Analysis of data from The Federal Housing Finance Agency and visualization show the yearly percentage change in housing price for Modesto (quarterly, 2001-2020). The observed drop in housing price between the years 2007-2012 refers to the years of financial crisis and recovery period. However, starting the year 2013 the housing price recovered its growth. The housing price added value up to 30% quarterly for years 2013-2015. Then the yearly percentage change indicates increase up to 10% quarterly starting 2015. Raise in home value causes increase in cost of rent as well. (Federal Housing Finance Agency)



Graph 2. Data retrieved from The Federal Housing Finance Agency Building Permits

Analysis of data from U.S. Census Bureau indicates significant drop in number of granted building permits. The number of single-family building permits used to be more than 400 a month, back in 2004. (US Census Bureau Building Permits Survey) There were significantly less permits granted in recent years. The numbers of permits dropped to 1 or even 0 for some months for Modesto, as observed in the charts and Table 1 below. (US Census Bureau Building Permits Survey) The Table 1 displayed below also compares the number of granted building permits in Modesto to other cities nearby for the year of 2019.



Charts. Data used from US Census (US Census Bureau Building Permits Survey)

|         | Madera | Merced | Modesto | Stockton | Visalia |
|---------|--------|--------|---------|----------|---------|
| 2019M1  | 33     | 10     | 1       | 99       | 80      |
| 2019M2  | 27     | 13     | 1       | 119      | 73      |
| 2019M3  | 31     | 25     | 1       | 195      | 135     |
| 2019M4  | 44     | 39     | 1       | 148      | 120     |
| 2019M5  | 49     | 10     | 1       | 214      | 120     |
| 2019M6  | 58     | 9      | 3       | 222      | 123     |
| 2019M7  | 35     | 30     | 2       | 135      | 169     |
| 2019M8  | 78     | 10     | 0       | 160      | 200     |
| 2019M9  | 51     | 3      | 4       | 141      | 105     |
| 2019M10 | 85     | 11     | 1       | 197      | 140     |

Table 1. New Privately-Owned Housing Units Authorized (1 unit, 2019 January-October, US Census)

Construction

Construction of new housing units lags not only in Modesto, but also in Stanislaus County. While Stanislaus County adds new residents, the construction of new dwellings does not follow the same rate. Imbalance between supply (housing units) and demand (population growth) creates shortage in housing market. Census data of "Housing Unit Estimate" displays the estimated number of newly added housing units for Stanislaus County.

| Housing Unit Estimate (as of July 1) |         |         |         |         |         |         |         |         |         |
|--------------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 2010                                 | 2011    | 2012    | 2013    | 2014    | 2015    | 2016    | 2017    | 2018    | 2019    |
| 179,578                              | 179,793 | 179,861 | 180,054 | 180,317 | 180,698 | 181,055 | 181,586 | 182,276 | 182,978 |

Table 2. US Census data

Using the average household size for the Stanislaus County (3.09 according to World Population Review), the number of newly added housing units, it is possible to estimate the number of housing units needed to satisfy the demand of growing population. This helps to compare the population growth, number of built dwellings and needed housing units.

### Results

The results display population growth, construction, building permits and change in housing price. The number of needed housing units is compared to number of built. The shortage in housing market may be observed in the chart below. While Stanislaus County (including Modesto) needs more housing units to fit its growing population, the number of newly built housing units are lagging. The difference between needed and built housing units is huge. This difference creates the imbalance between supply and demand, thus, the raise in housing prices and cost of rent.

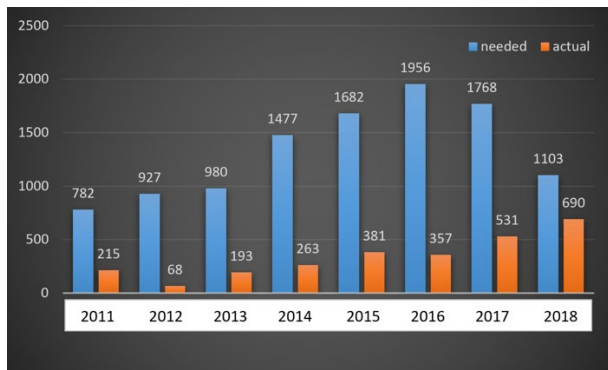


Chart. Actual vs needed housing units, Stanislaus County. US Census data.

### Discussion

This research helps to understand the key factors behind the rapidly increasing housing prices and cost of rent in Modesto. Collected data and its visualization helped to observe the change in housing prices over time, population growth, number of granted permits and construction of new housing units and compare these key factors.

This research provides knowledge on Modesto's housing problem by collecting data, estimating the average household size, comparing number of required housing units to population growth and new dwellings constructed. Collecting data on key factors also helps to better understand the factor causing imbalance between supply and demand.

Better knowledge on the housing problem helps to identify the causes and provide possible solutions. These solutions include easing the process of grating building

permits and expanding the construction by promoting better policies for companies. Expanding construction will add more jobs on its side benefiting local communities. Eliminating the imbalance between supply and demand will make the prices drop down or increase at a slow rate changing the situation over time.

This study is important since Modesto's housing problem affects many residents and families. The cost of rent has increased rapidly. A lot of families spent most of their budget paying for rent. In other hand, there are vulnerable communities who faces difficulties in finding affordable housing. Some families face being homeless. Many already were not able to pay rent, thus had to leave apartments following eviction. Rapidly increasing housing prices and cost of rent will aggravate Modesto's housing problem in next years.

This research does not investigate the state-wide increase in housing price, but only explores the cause of housing shortage that adds value to home prices and cost of rent on top of state- or nationwide increase. Also, this research approaches the housing problem from the perspective of residents and families, not the landlords or investors who benefit from increasing housing prices and cost of rent.

### References

- [1] Carlson, Ken. "Can't Afford to Move, Can't Afford to Stay': Spike in Housing Costs Has Many Stuck." *The Modesto Bee*, Modesto Bee, 30 July 2019, 08:17 PM, [www.modbee.com/news/local/article233298402.html](http://www.modbee.com/news/local/article233298402.html).
- [2] Carlson, K. (2019, August 15). Why so few places to live in Modesto? A clue. It has to do with raging economy. Retrieved April 17, 2020, from <https://www.modbee.com/news/local/article23400777.html>
- [3] Carlson, K. (2019, July 22). Modesto has a severe housing shortage. Here's how and when all the problems started. Retrieved April 17, 2020, from <https://www.modbee.com/news/local/article232977642.html>
- [4] Carlson, Ken. "Why so Few Places to Live in Modesto? A Clue. It Has to Do with Raging Economy." *The Modesto Bee*, 15 Aug. 2019, [www.modbee.com/news/local/article234000777.html](http://www.modbee.com/news/local/article234000777.html).
- [5] "City of Modesto Analysis of Impediments to Fair Housing." *City of Modesto*, Bay Area Economics,

permits and expanding the construction by promoting better policies for companies. Expanding construction will add more jobs on its side benefiting local communities. Eliminating the imbalance between supply and demand will make the prices drop down or increase at a slow rate changing the situation over time.

www.modestogov.com/ArchiveCenter/ViewFile/Item/2981. Federal Housing Finance Agency. (n.d). Retrieved April 17, 2020, from <https://www.fhfa.gov/>

[6] “Modesto, California Population 2021.” *Modesto, California Population 2021 (Demographics, Maps, Graphs)*, worldpopulationreview.com/us-cities/modesto-ca-population.

[7] Soydemir, G. (2019). San Joaquin Valley Business Forecast. Retrieved April 17, 2020, from <https://www.csustan.edu/sjvbf>

[8] *Stanislaus County, California Population 2021*, worldpopulationreview.com/us-counties/ca/stanislaus-county-population.

[9] US Census Bureau (MCD): Cheryl Cornish, Stephen Cooper. “US Census Bureau Building Permits Survey.” *Census.gov*, 23 Aug. 2011, [www.census.gov/construction/bps/](http://www.census.gov/construction/bps/).

# Computational Docking of Potential Drug Inhibitors of SARS-CoV-2 Main Protease

John V Molthen

*B.S. Candidate, Department of Chemistry, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

*Received 14 May 2021; accepted 20 July 2021*

---

## Abstract

Computational biology and chemistry have become more relevant with the new technology of the 21st century. Many programs are used as replicas for experimental results, and visualizations of the chemical and microbiological world. This project is focused on docking drugs to the Main Protease of SARS-CoV-2 using AutoDock Vina, a computational docking program. With the quantum mechanical equations done by the program, it should give results within 5% of the actual experimental results. If it does do this, it can be considered a good model for the actual experiment.

*Keywords: AutoDock, Main Protease, Protease Inhibitors*

---

## Introduction

This project is focused on the main protease of SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2), more commonly known as COVID-19. Before diving into what this protease is and what it does, a little background of SARS-CoV-2 should be given. SARS-CoV-2 is a coronavirus. Coronaviruses are members of the subfamily Coronavirinae in the family Coronaviridae<sup>1</sup>. This subfamily can be divided into four different genera based on their genomic structures and physiological activities<sup>1</sup>. The four genera are: Alphacoronavirus, Betacoronavirus, Gammacoronavirus, and Deltacoronavirus<sup>1,2</sup>. Out of these four, only Alphacoronavirus and Betacoronavirus have been found to cause human diseases (Marty). Both of these genera usually will cause respiratory illness in humans<sup>1</sup>. Alphacoronavirus are usually not deadly to humans and cause symptoms of the common cold, while Betacoronavirus is known to be the deadliest to humans<sup>2</sup>. Within the Betacoronavirus genus falls Severe Acute Respiratory Syndrome (SARS-CoV), Middle East Respiratory Syndrome (MERS-CoV), and the latest addition to the list of Severe Acute Respiratory Syndrome 2 (SARS-CoV-2). This new coronavirus, however, has turned into a world-wide pandemic. The first reports of SARS-CoV-2 came from Wuhan, China<sup>3,4</sup>. This coronavirus is theorized to have come from a *Rhinoplophus affinis* bat, as RaTG13 (the coronavirus in bats) is about 96% identical to it, but this has not been proven<sup>4,5</sup>. What is known about this coronavirus is that it can be deadly<sup>6</sup>. This implies that as a community, scientists have to work together to stop this virus and end the pandemic.

One approach suggested to stop this virus is inhibiting its main protease. This protease is a 3-chymotrypsin-like protease<sup>6</sup>. This main protease is about 306 amino acids long and its responsible for allowing the polypeptide to be processed into functional proteins<sup>7,8</sup>. The activities of this protease are activated by a substate that bind to the proteins active site. However, there are some substrates that could block this action from occurring called inhibitors. If an inhibitor could disable the main protease from carrying out its conventional function, then that could be a huge step towards ending this pandemic.

Possible protease inhibitors have been suggested to be HIV/AIDS drug inhibitors<sup>9</sup>. This experiment will be putting that suggestion to the test, through computational work. All of the drugs listed in *Table 1* are FDA approved protease inhibitors and were chosen to dock to the main protease<sup>10</sup>. Computational is being used more and more often in these times. Not only does it drastically decrease the cost and time put into drug development, but it is also an efficient way to be safe way to do research away from the lab during this pandemic<sup>11</sup>.

Table 1: FDA Approved Protease Inhibitors<sup>10</sup>

|               |
|---------------|
| Drug          |
| Darunavir     |
| Fosamprenavir |
| Indinavir     |
| Nelfinavir    |

## Tipranavir

AutoDock Vina is a molecular docking program that was used to determine the affinities of the drugs to the protease. This program is based on a series of different quantum mechanical calculations<sup>12,13</sup>. It will use the input protein-ligand complex and will calculate the lowest probable configuration in terms of  $\Delta G$  values<sup>12,13</sup>. The  $\Delta G$  values are calculated using the equation in *Figure 1*. This equation was created by taking into consideration of five key parameters. It takes into consideration van der Waals interactions, hydrogen bonding, electrostatics, desolvation, and the torsional component of these protein-ligand interactions<sup>14</sup>. The protease-drug complex with the lowest  $\Delta G$  value will be determined to be the optimal complex out of the complexes tested. The results from all of the complexes obtained should be compared to experimental data to determine if they are within 5% error. The results from this work could possibly help strengthen the development of halting SARS-CoV-2 activity.

$$\begin{aligned}\Delta G = & \Delta G_{\text{vdW}} \sum_{i,j} \left( \frac{A_{ij}}{r_{ij}^{12}} - \frac{B_{ij}}{r_{ij}^6} \right) \\ & + \Delta G_{\text{Hbond}} \sum_{i,j} E(t) \left( \frac{C_{ij}}{r_{ij}^{12}} - \frac{D_{ij}}{r_{ij}^{10}} + E_{\text{Hbond}} \right) \\ & + \Delta G_{\text{elec}} \sum_{i,j} \frac{q_i q_j}{\epsilon(r_{ij}) r_{ij}} \\ & + \Delta G_{\text{tor}} N_{\text{tor}} \\ & + \Delta G_{\text{sol}} \sum_{i_c, j} S_i V_j e^{(-r_{ij}^2/2\sigma^2)}\end{aligned}$$

Figure 1: AutoDock Vina  $\Delta G$  Calculation

### Methods

The procedure followed in this lab was based off of Prasanth et. al.'s article<sup>15</sup>. This procedure included the use of multiple different computer programs. These programs include PyMol, AutoDock Tools, and AutoDock Vina<sup>16,17,18</sup>. PyMol was used to visualize the protein-drug complex's, AutoDock Tools was used to prepare the complexes to be tested by AutoDock Vina, and AutoDock Vina was then used to test the affinities of the protein drug complexes.

Before using any programs though, multiple things had to be determined. First, the correct structure of the main protease, its active site coordinates, and its dimensions for the gridbox for the

AutoDock programs had to be determined. These were found using Prasanth et. al.'s article<sup>15</sup>. The PDB ID for the main protease was 6LU7. The active site and the grid box dimensions for this structure was determined to be  $x = -17.59$ ,  $y = 15.81$ ,  $z = 63.53$  and  $30 \times 30 \times 30 \text{ \AA}^3$  respectfully. These values were inserted into AutoDock Tools and the polar hydrogen atoms and Kollman Charges were added to the protein. All of the water molecules were also deleted from the structure using AutoDock Tools. The next thing that had to be done was to find possible inhibitors.

The possible inhibitors found were when looking into the FDA's website for protease inhibitors. The inhibitors found and used in this experiment were Darunavir, Fosamprenavir, Indinavir, Nelfinavir, and Tipranavir. To use these drugs, their 3D structures were downloaded off of PubChem<sup>19</sup>. Their PubChem ID's were: 213039 for Darunavir; 131536 for Fosamprenavir; 5362440 for Indinavir; 64143 for Nelfinavir; and 54682461 for Tipranavir. Once everything was downloaded AutoDock Vina was used to dock the ligands to the protein and each affinity was tested. PyMol was then used to visualize all of these interactions.

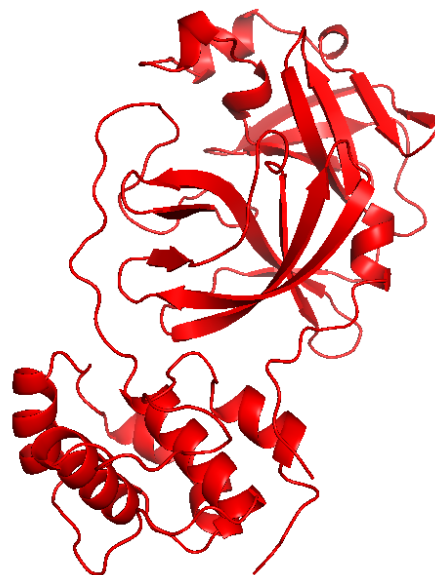


Figure 2: A visualization from PyMol of the Main Protease

Table 2: Visualizations from PyMol of all of the drugs before they are docked to the Main Protease.

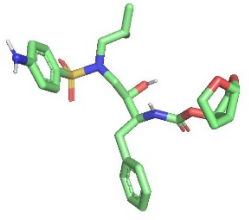
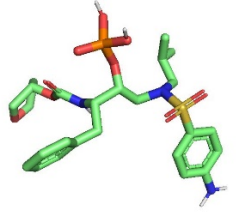
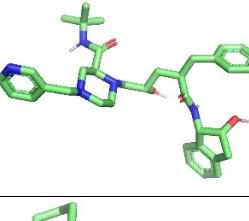
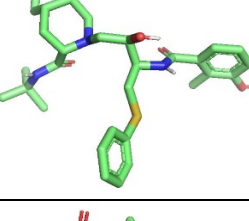
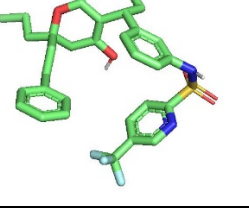
|   |               |
|---|---------------|
|    | Darunavir     |
|    | Fosamprenavir |
|    | Indinavir     |
|   | Nelfinavir    |
|  | Tipranavir    |

Table 2 Legend

| Atom     | Color  |
|----------|--------|
| Carbon   | Green  |
| Hydrogen | White  |
| Oxygen   | Red    |
| Nitrogen | Blue   |
| Sulfur   | Yellow |
| Fluoride | Teal   |

## Results

In the experiment the main protease of SARS-CoV-2, shown in *Figure 2*, was the protein that

I used to dock the five protease inhibitors to. These drugs are shown in *Table 2*. Using the calculations shown in *Figure 1*, AutoDock Vina was able to calculate the  $\Delta G$  values for all of the protein-drug complexes. The energies of these complexes were calculated and further tabulated into *Tables 3* and *4*. The lowest energy complex was determined to be the nelfinavir-main protease complex. Its binding energy was calculated to be -8.2 kcal/mol.

In *Tables 3* and *4*, the standard deviations of all of the trials for the complexes were calculated. All of the standard deviations calculated were 0.25 or less. These are very low standard deviations, which means that the precision of this program is very high. However, relative to each other the standard deviations are very different. This can be explained using a couple of different concepts. First, looking at the calculations that AutoDock Vina performs, in *Figure 1*, to obtain  $\Delta G$  values, we can see that there is a torsional component. This torsional component is important because in molecules the bonds between atoms have different vibrational and rotational modes. With these different rotations and vibrations, the drug can orient itself in different positions, causing the functional groups of the drugs to interact with different residues of the protein. It is also possible that there are variations of the standard deviations, because the complexes have multiple minimum energy positions. If AutoDock Vina is calculating the minimum energy and thinks that it has found the global minimum, because the orientations of the molecule that it tries after it finds the minimum, then it is possible for it to be wrong. AutoDock Vina may mistake a local minimum as a global minimum. This would ultimately change the energy values that the program calculates.

Table 3: Energies of Main Protease-Drug Complexes

| Drug  | Darunavir | Fosamprenavir | Indinavir |
|---|-----------|---------------|-----------|
| Trial 1<br>/kcal* $\text{mol}^{-1}$           | -7.6      | -7.6          | -8        |
| Trial 2<br>/kcal* $\text{mol}^{-1}$           | -7.7      | -7.7          | -8.1      |
| Trial 3<br>/kcal* $\text{mol}^{-1}$           | -7.7      | -7.4          | -8        |
| Trial 4<br>/kcal* $\text{mol}^{-1}$           | -7.8      | -7.4          | -8        |
| Average<br>Energy<br>/kcal* $\text{mol}^{-1}$ | -7.7      | -7.5          | -8        |
| Standard<br>Deviation                         | 0.082     | 0.15          | 0.05      |



Table 4: Energies of Main Protease-Drug Complexes

| Drug                      | Nelfinavir | Tipranavir |
|---------------------------|------------|------------|
| Trial 1 (kcal/mol)        | -8.2       | -7.4       |
| Trial 2 (kcal/mol)        | -7.9       | -7.6       |
| Trial 3 (kcal/mol)        | -8.3       | -7         |
| Trial 4 (kcal/mol)        | -8.5       | -7.4       |
| Average Energy (kcal/mol) | -8.2       | -7.4       |
| Standard Deviation        | 0.25       | 0.25       |

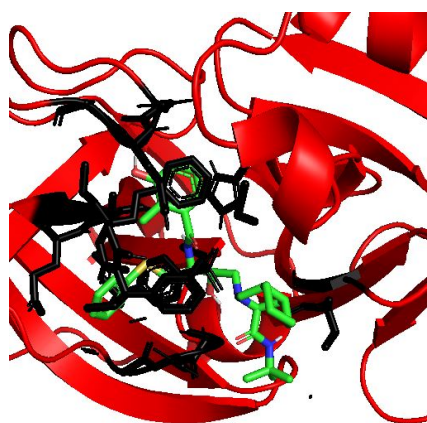


Figure 3: Nelfinavir-Main Protease Complex with Active Site Residues Shown in Black, Generated by PyMol

Figure 4 shows the nelfinavir-main protease complex. Since the nelfinavir-main protease complex has the lowest binding energy, nelfinavir can be considered the best inhibitor for the main protease. However, this doesn't mean that it will be the best inhibitor if they were all tested in a lab, but it is predicted to be the best.

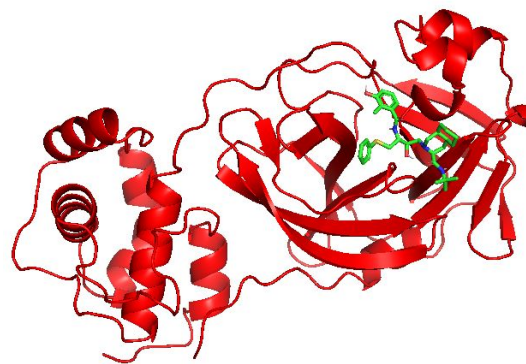


Figure 4: Nelfinavir-Main Protease Complex Generated by PyMol

Once all of the energies were calculated they could be compared to the literature values of the complexes. However, only one value was recovered from the literature was for the indinavir-main protease complex. The literature value found was  $-7.6$  kcal/mol<sup>20</sup>. When this value was compared to the value calculated by AutoDock Vina, it was determined to have a 5.30 percent error. This was slightly greater than the predicted percent error. Without any more data from the literature, these comparisons cannot be made.

### Discussion

Before testing the procedure stated in this article another procedure was tested. This procedure was based off of Monthay's and Ramesh's article<sup>7</sup>. In this article a protein model of the main protease was made using the Swiss Model. This model was created by inputting the DNA sequence for the main protease (region 1541-1858), downloaded from GenBank (accession number: P0C6X7.1), into the Swiss Model program<sup>7</sup>. This article was published prior to there being an accurate structure on the PDB website, so the first thing that had to be done was to check the accuracy of the Swiss Model to the PDB structure. Both of these models were uploaded to PyMol and aligned to each other. In Table 4 it can be seen that the RMSD value that PyMol calculated to be  $14.650$  Å. This number was very high for an RMSD value. Identical proteins should give RMSD values ranging from  $0-1.2$  Å<sup>21</sup>. Since the RMSD value obtained was so high, this model protein was determined to be inaccurate. This Swiss Model protein structure was not used to dock the possible inhibitors to.

Table 4: RMSD of Swiss Model and Main Protease (6LU7)

|         |        |
|---------|--------|
| RMSD /Å | 14.650 |
|---------|--------|

Another problem that arrived when doing this project was that there was some trouble finding binding energy values to compare to the computational results. However, there was some data found in the literature for kinetics data for these complexes. I believe that in the future, I can calculate the binding energy values from the kinetics data and compare the rest of the AutoDock results to the literature. I would be able to furthermore prove whether my thesis is correct or not.

I plan to continue working on this research topic; however, I would like to take it in a new direction. I would like to study different variants of the main protease with these same protease inhibitors. It would be interesting to see how the binding energy changes with these variants. I would also like to work on drug design with the wild type enzyme as well as with the variants that I test. Working on drug design for these proteases could possibly help end the current pandemic.

### Conclusion

This project was successful and unsuccessful in a few different ways. I was unsuccessful determining whether AutoDock Vina was an accurate enough program to use for most of these complexes. However, I did find that the complex I was able to compare to the literature, the indinavir-main protease complex, had a percent error of 5.30%, which was just over the predicted value of 5% error. I was also successful in determining the best predicted inhibitor for the main protease. The nelfinavir-main protease complex had a  $\Delta G$  value of -8.2 kcal/mol. This was the lowest energy value I calculated, making nelfinavir the best inhibitor of the ones tested.

### Acknowledgements

This project would not have been possible without the funding and guidance of the McNair Scholars Program. I would also like to recognize Dr. Koni Stone from California State University, Stanislaus for guidance on this project as well.

### References

- [1] Cui, J.; Li, F.; Shi, Z.-L. Origin and Evolution of Pathogenic Coronaviruses. *Nat. Rev. Microbiol.* **2019**, *17* (3), 181–192.
- [2] Marty, A. M.; Jones, M. K. The Novel Coronavirus (SARS-CoV-2) Is a One Health Issue. *One Health* **2020**, *9* (100123), 100123.
- [3] Wu, F.; Zhao, S.; Yu, B.; Chen, Y.-M.; Wang, W.; Song, Z.-G.; Hu, Y.; Tao, Z.-W.; Tian, J.-H.; Pei, Y.-Y.; et al. A New Coronavirus Associated with Human Respiratory Disease in China. *Nature* **2020**, *579* (7798), 265–269.
- [4] Zhou, P.; Yang, X.-L.; Wang, X.-G.; Hu, B.; Zhang, L.; Zhang, W.; Si, H.-R.; Zhu, Y.; Li, B.; Huang, C.-L.; et al. A Pneumonia Outbreak Associated with a New Coronavirus of Probable Bat Origin. *Nature* **2020**, *579* (7798), 270–273.
- [5] Andersen, K. G.; Rambaut, A.; Lipkin, W. I.; Holmes, E. C.; Garry, R. F. The Proximal Origin of SARS-CoV-2. *Nat. Med.* **2020**, *26* (4), 450–452.
- [6] Mori, M.; Capasso, C.; Carta, F.; Donald, W. A.; Supuran, C. T. A Deadly Spillover: SARS-CoV-2 Outbreak. *Expert Opin. Ther. Pat.* **2020**, *30* (7), 481–485.
- [7] Mothay, D.; Ramesh, K. V. Binding Site Analysis of Potential Protease Inhibitors of COVID-19 Using AutoDock. *Virusdisease* **2020**, *31* (2), 1–6.
- [8] Wang, F.; Chen, C.; Tan, W.; Yang, K.; Yang, H. Structure of Main Protease from Human Coronavirus NL63: Insights for Wide Spectrum Anti-Coronavirus Drug Design. *Sci. Rep.* **2016**, *6* (1), 22677.
- [9] Ngo, S. T.; Quynh Anh Pham, N.; Thi Le, L.; Pham, D.-H.; Vu, V. V. Computational Determination of Potential Inhibitors of SARS-CoV-2 Main Protease. *J. Chem. Inf. Model.* **2020**, No. acs.jcim.0c00491. <https://doi.org/10.1021/acs.jcim.0c00491>.
- [10] HIV and AIDS: Medicines to Help You. *Food and Drug Administration*. <https://www.fda.gov/consumers/free->

- publications-women/hiv-and-aids-medicines-help-you (accessed Sep 6, 2020).
- [11] Marshall, G. R. Computer-Aided Drug Design. *Annu. Rev. Pharmacol. Toxicol.* **1987**, 27 (1), 193–213.
- [12] Ryde, U.; Söderhjelm, P. Ligand-Binding Affinity Estimates Supported by Quantum-Mechanical Methods. *Chem. Rev.* **2016**, 116 (9), 5520–5566.
- [13] Kuhn, B.; Kollman, P. A. Binding of a Diverse Set of Ligands to Avidin and Streptavidin: An Accurate Quantitative Prediction of Their Relative Affinities by a Combination of Molecular Mechanics and Continuum Solvent Models. *J. Med. Chem.* **2000**, 43 (20), 3786–3791.
- [14] Morris, G. M. Equations — AutoDock <http://autodock.scripps.edu/resources/science/equations> (accessed Apr 30, 2021).
- [15] Prasanth, D. S. N. B. K.; Murahari, M.; Chandramohan, V.; Panda, S. P.; Atmakuri, L. R.; Guntupalli, C. In Silico Identification of Potential Inhibitors from Cinnamon against Main Protease and Spike Glycoprotein of SARS CoV-2. *J. Biomol. Struct. Dyn.* **2020**, 1–15.
- [16] The PyMOL Molecular Graphics System, Version 2.0 Schrödinger, LLC.
- [17] Goodsell, D. S.; Olson, A. J. Automated Docking of Substrates to Proteins by Simulated Annealing. *Proteins* **1990**, 8 (3), 195–202.
- [18] O. Trott, A. J. Olson, AutoDock Vina: improving the speed and accuracy of docking with a new scoring function, efficient optimization and multithreading, *Journal of Computational Chemistry* 31 (2010) 455-461 PubChem. PubChem <https://pubchem.ncbi.nlm.nih.gov/> (accessed Oct 18, 2020)
- [19] Li, Z.; Li, X.; Huang, Y.-Y.; Wu, Y.; Liu, R.; Zhou, L.; Lin, Y.; Wu, D.; Zhang, L.; Liu, H.; Xu, X.; Yu, K.; Zhang, Y.; Cui, J.; Zhan, C.-G.; Wang, X.; Luo, H.-B. Identify Potent SARS-CoV-2 Main Protease Inhibitors via Accelerated Free Energy Perturbation-Based Virtual Screening of Existing Drugs. *bioRxiv*, 2020. <https://doi.org/10.1101/2020.03.23.004580>.
- [20] Kufareva, I.; Abagyan, R. Methods of Protein Structure Comparison. *Methods Mol. Biol.* **2012**, 857, 231–257.

# The Effects of Resistance Training on Chronic Low Back Pain: Walking Interventions vs. RT

Navjot Nahal

*B.S. Candidate, Department of Exercise Science, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

Received 16 April 2021; accepted 20 July 2021

---

## Abstract

A predominant cause of chronic lower back pain (CLBP) is muscle weakness. Addressing this concern from the root by increasing muscular strength should have pragmatic results. Resistance training is a general rehabilitative protocol prescribed to clients to target strength gain with the intention of reversing CLBP and related disability. To determine whether resistance training is as effective as deemed, it was compared to a walking intervention through a meta-analysis. The target population consisted of CLBP clients who were assessed through two variables: subjective pain levels and disability. Resistance training was predicted to be a more efficient form of treatment compared to walking, but the analyzed studies suggested otherwise. No conclusion could be drawn supporting resistance training as the more effective treatment form; a walking intervention was just as advantageous. Resistance training should not be the sole means of rehabilitation for CLBP clients since following a walking protocol decreased pain and improved disability to no lesser degree.

*Keywords: chronic pain, resistance training*

---

## Introduction

Pain is a concern that should not be taken lightly, yet the number of people experiencing such discomfort is rising day by day. Specifically, chronic lower back pain (CLBP) has been an issue in our societies. Elfien (2019) compares the prevalence of back pain from the year 2000 to 2016, and the percent of surveyed individuals reporting pain during both years was almost identical. More than 1 in 4 Americans were suffering from lower back pain despite there being a 16-year difference between both surveys (Elfein, 2019). Crombez, Vlaeyen, Heuts, and Lysens (1999) concluded that the fear that comes with CLBP is more disabling on individuals than the localized pain. Researchers studied 104 participants and discovered a high correlation between the measure individuals take because of having CLBP and disability levels; those who took more precautions reported higher disability levels (Crombez et al., 1999). This fear hesitates individuals from taking long-term solutions, and many resort to pharmaceuticals with adverse side effects or even dependency.

Treatments such as prolonged rehabilitation are starting to show some positive effects in easing pain levels and should be further explored. Rehabilitation is a non-invasive technique that is performed in the comfort of one's home with limited equipment necessary. Resistance training, in particular, is a form of rehabilitation that progressively overloads the muscular system to increase muscular strength and endurance. Resistance training can be analyzed over a spectrum from education and going all the way to a wide range of exercise types. To start, Donzelli, Di Domenica, Cova, Galletti, and Giunta (2006) took an education approach and analyzed Pilates CovaTech, a form of resistance training. Pilates CovaTech involves strength training while using body weight as resistance to educating individuals about analgesic, posture, mobilization, and stretching (Donzelli et al., 2006). Simply educating individuals on this form of resistance training was proven as a treatment option for CLBP (Donzelli et al., 2006).

Comparatively, Winett and Carpinelli (2001) early on validated the benefits of progressive resistance training. These benefits include—but are not limited to: reducing risk factors for predominant diseases such as diabetes, prevention of sarcopenia and osteoporosis, and other effects on the musculoskeletal system (Winett & Carpinelli, 2001). Both groups of researchers promoted studying resistance training and this context, prescribing it to individuals with chronic lower back pain.

Though CLBP seems dominant in today's population, research suggests that one form of therapy might be more effective than another in treating CLBP, and certain types of resistance training may have alternative effects as well. The following studies will explore the impact of resistance training on individuals with chronic lower back pain to determine whether or not it is an effective treatment. Resistance training protocols will be compared to walking protocols to validate that they are more effective in reducing pain and improving disability than walking. The simplicity of walking should not undermine the scientific basis of resistance training: increasing muscular strength and preventing muscular weakness.

## Methods

The research follows a meta-analysis design using secondary sources from the BioMed Central and EBSCOHost databases. Journal articles from the National Institutes of Health (NIH) and similar organizations were gathered to reveal to what extent resistance training decreased chronic lower back pain and disability. Keywords such as “chronic LBP” and “resistance training” refined the searches. Trials comparing resistance training and walking interventions were used to quantify degrees of pain and levels of disabilities. The articles were filtered via reliability and date published; they were screened to see if they were peer-reviewed and published recently. A compilation of several peer-reviewed articles that met the criteria solidified this research.

*Inclusions:* Participation in the studies was limited to the inclusion factors associated with individual trials. All participants were diagnosed with non-specific chronic lower back pain that could not have been terminated with medical procedures such as surgery.

## Results

Resistance training is a form of rehabilitation used to treat chronic lower back pain (CLBP). A predominant cause of CLBP is muscle weakness. If muscle weakness is managed via resistance training, can CLBP be eliminated? I hypothesize that resistance training is an effective method to treat CLBP and more effective than walking because it increases muscular strength. While comparing resistance training to walking, resistance training should be more effective in decreasing pain, and improving disability.

### Strength Exercise and Walking Effects on Lumbar Function

Lee and Kang (2016) sought to understand the effects of strength training and walking on overweight, non-active adults. These adults had not participated in any exercise six months before the study. The participants were diagnosed by a physician after reviewing x-rays of the lower back (Lee & Kang, 2016). Participants were randomly assigned to three groups: a control group (CG), a strength exercise group (SEG), and a combined exercise group (CEG). The CG had six participants with a mean age of  $43.3 \pm 9.9$ , the SEG's mean age was  $42.7 \pm 13.1$ , and the CEG had a mean age of  $46.7 \pm 8.1$ . Both exercise groups consisted of 15 participants each, whereas the control group had six (Lee & Kang, 2016). The exercise groups completed 12 weeks of training under a professional trainer twice a week for 50 minutes; the participants exercised at a moderate to a hard intensity at an RPE of 11-16 (Lee & Kang, 2016). Lower back disability was measured using the Roland-Morris Disability Questionnaire (RMDQ), and lower back pain was measured using the VAS scale.

The SEG performed only strength training exercises. This group had a baseline RMDQ score of  $3.8 \pm 3.7$  and a final score of  $1.1 \pm 0.9$  (Lee & Kang, 2016). The CEG performed strength training along with a walking protocol using a step-box. This group had a baseline RMDQ value of  $6.3 \pm 4.8$  which then decreased to  $1.8 \pm 2.1$ , and the control group had a baseline value of  $0.8 \pm 1.2$  which then changed to  $1.7 \pm 1.6$  after 12 weeks (Lee & Kang, 2016). Despite both exercise groups lowering disability levels, only the combined exercise group had a statistically significant decrease.

The pre-training VAS scores for the SEG were  $32.3 \pm 14.9$ ; this value significantly decreased to  $22.0 \pm 11.3$  (Lee & Kang, 2016). Similarly, the pre-training VAS scores for the CEG were  $45.3 \pm 14.8$  which drastically lowered to  $33.1 \pm 20.0$ . Both exercise groups had a statistically significant decrease at  $p < 0.05$  (Lee & Kang, 2016). It is evident that strength training, with or without walking, decreases the degree of lower back pain. The control group participated in no exercise and had a baseline VAS score of  $24.2 \pm 9.2$ ; this significantly increased to  $35.8 \pm 17.2$  (Lee & Kang, 2016). Authors Lee and Kang (2016) were able to support that inactive individuals with CLBP will find relief through a

lifestyle modification of adding exercise to their daily regimen.

### A Synergy of Rehabilitation Program and Treadmill Exercise

Cho and the authors (2015) compared the effects of walking and a traditional rehabilitation program that targeted strengthening in twenty men aged from 22 to 36 years. Individuals with other health conditions categorized under musculoskeletal, neurological, heart disease, and spine deformation were excluded. Two groups were randomly assigned ten men who performed normal rehabilitation training for thirty minutes three times a week for eight weeks. The experimental group was prescribed an additional thirty minutes of treadmill walking each week, and the non-walking group was labeled as the control group (Cho et al., 2015).

The average age of the control group was  $27.7 \pm 4.2$ , and the mean age of the experimental group was  $29.1 \pm 4.8$  (Cho et al., 2015). The average weight for both groups was categorized as normal weight. The control group's VAS score altered from an average of  $36.6 \pm 17.4$  to  $20.5 \pm 13.1$  post-training. The experimental group's VAS score reduced from an average of  $31.3 \pm 17.9$  to  $16.9 \pm 9.3$  after eight weeks (Cho et al., 2015). Both groups experienced pain to a much lower degree than before the training. While comparing the two, neither could be supported as more efficient than the other.

A lower back disability was measured using the Oswestry Disability Index (ODI). The control group started with a baseline disability average of  $16.5 \pm 3.5$ , and after the study, the ODI was  $14.4 \pm 5.0$  (Cho et al., 2015). The experimental group started with an average score of  $14.9 \pm 3.0$ , which then decreased to  $11.7 \pm 1.7$  (Cho et al., 2015). Both groups had a better quality of life after the training sessions were complete because their degree of disability was lowered.

### A Walking Program vs. Muscular Strength Training

Authors Shnayderman and Katz-Leurer (2012) compared a walking program to a muscular strengthening program in 52 sedentary individuals. They aimed to determine whether walking was just as effective as strength training in reducing pain. The Low Back Pain Functional Scale (LBPFS) was used to measure pain, and the Oswestry Low Back Pain Disability Questionnaire (ODQ) was used to analyze the degree of disability. The participants were divided into two groups: a walking group and an exercise group. The average age of the walking group was  $47.0 \pm 10.0$ , and the average age of the exercise group was  $43.6 \pm 13.5$  (Shnayderman & Katz-Leurer, 2012).

The exercise group had an LBPFS score of  $52.8 \pm 9.7$  before the intervention, and after performing strength training twice a week for six weeks, this score increased to  $60.9 \pm 11.6$ . The walking group started with an average score of  $49.5 \pm 8.4$ , and their score increased to  $59.6 \pm 13.5$  (Shnayderman & Katz-Leurer, 2012). Noting that a higher score indicates less pain and better function, it was

concluded that both groups felt less pain after the interventions.

The ODQ of the exercise group at baseline was  $27.5 \pm 15.3$ , but after strength training, this decreased to  $19.1 \pm 12.8$ . The walking group started with a pre-training ODQ score of  $34.4 \pm 17.0$  that then decreased to  $22.6 \pm 14.4$  after the walking intervention (Shnayderman & Katz-Leurer, 2012). Both groups were effective in decreasing pain and disability, but neither could be described as being more effective than the other; walking was just as effective as strength training.

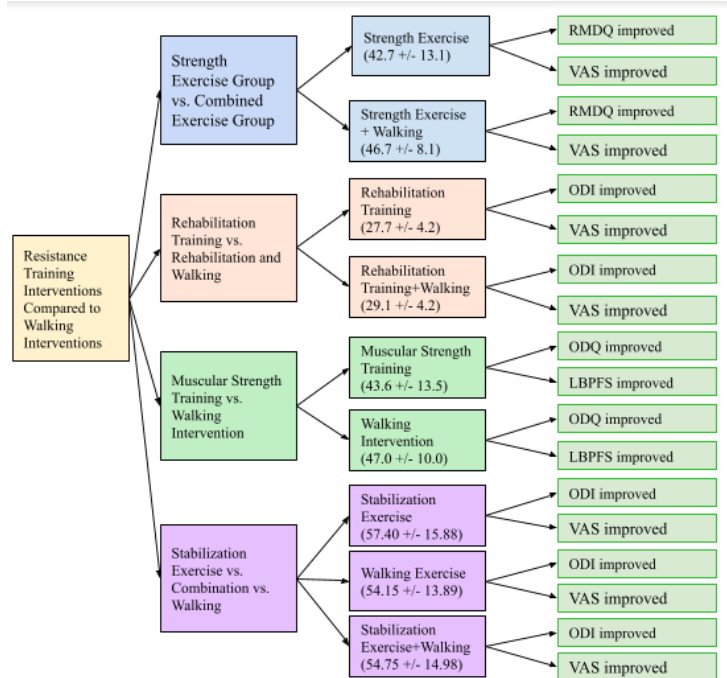
### Lumbar Stabilization Exercises vs. Walking Exercises

Suh and the authors (2019) evaluated a walking protocol against a lumbar stabilization protocol. The participants were divided amongst four groups, but only three groups will be analyzed in this review. The stabilization exercise group (SE) had a mean age of  $57.40 \pm 15.88$ , the walking exercise group (WE) had a mean age of  $54.15 \pm 13.89$ , and the third group, the stabilization and walking group (SWE), had a mean age of  $54.75 \pm 14.98$  (Suh et al., 2019). The SE group performed an individualized graded lumbar stabilization exercise (IGLSE) protocol. The IGLSE protocol consisted of five minutes of stretching followed by twenty-five minutes of moderate, progressive stabilization exercises. The WE group followed a protocol of abdominal bracing and speed walking; the SWE group performed both protocols (Suh et al., 2019).

After six weeks of training, disability levels were measured using the ODI. All three groups had statistically significant decreases in ODI; the WE group had a baseline of  $28.1 \pm 12.8$  that then decreased to  $22.5 \pm 7.4$ . The SE group also had a significant reduction from  $31.4 \pm 13.2$  to  $25.3 \pm 9.9$ , and the SWE group's score reduced from  $30.4 \pm 12.9$  to  $24.9 \pm 12.3$  (Suh et al., 2019). There was no difference in the groups indicating that one was more effective than the other.

After twelve weeks of training, the pain levels were measured using the VAS scale during rest and physical activity. During rest, the WE group's score changed from  $30.58 \pm 20.92$  to  $20.00 \pm 17.58$ , and the SE group's score improved from  $37.50 \pm 21.78$  to  $22.50 \pm 23.72$ . The SWE group decreased from  $30.00 \pm 30.38$  to  $20.83 \pm 26.44$  during rest (Suh et al., 2019). During physical activity, all groups also experienced pain to a lower degree. The WE group's VAS score decreased from  $59.61 \pm 11.45$  to  $30.00 \pm 21.32$ , the SE group's VAS score decreased from  $69.00 \pm 14.49$  to  $26.00 \pm 23.07$ , and the SWE group's score dropped from  $59.58 \pm 22.61$  to  $39.55 \pm 25.44$  (Suh et al., 2019). Though all groups had experienced less pain, while looking at the six-week mark, only the SE group had statistically significant decreases at  $p < 0.05$ . Regardless, during physical activity at the twelve-week evaluation, all groups felt better.

All the four studies had the same conclusions: walking and resistance training are equally beneficial in bettering the quality of life of individuals with CLBP.



### Discussion

The hypothesis that resistance training is more effective than walking for decreasing chronic lower back pain cannot be confirmed. Though it is proven to be very effective in the literature above, resistance training does not lower pain levels and improve disability any more than walking. All trials that included walking interventions concluded that individuals felt less pain, and these values were statistically significant. There was no statistically significant difference between the independent groups. Furthermore, additional research should be conducted to observe the long-term effects of both interventions and to ultimately discover a more supported conclusion. Then, that should be implemented into treatment plans made by physical therapists and be incorporated into daily living activities to decrease unhealthy or addicting forms of treatment.

A strength of this analysis is various aspects of resistance training and walking. For example, a combination of the two training methods was compared to each sole method. Resistance training was the core idea of this review, and many modes of it were discussed to validate it; only then was the comparison made. A limitation of this study was that there were no long-term trials. All trials ended at 12 weeks or earlier. Further research would help define and answer the question of whether both interventions are equally effective in decreasing chronic lower back pain and improving disability in the long run.

These results were quite surprising. The power of walking is drastically underestimated, and the general population is unaware of the easy benefits they can receive by this minor lifestyle modification of adding walking into their daily regimen.

### Acknowledgements

A special thanks to Dr. Brent Powell, Associate Professor of Health Promotion at CSU Stanislaus for guidance, feedback and support on this research.

## References

- [1] Cho, Y.K., Kim, D.Y., Jung, S.Y., & Seong, J.H. (2015). Synergistic effect of a rehabilitation program and treadmill exercise on pain and dysfunction in patients with chronic low back pain. *Journal of Physical Therapy Science*. 27(4), 1187-1190. <http://doi.org/10.1589/jpts.27.1187>
- [2] Crombez G., Vlaeyen J., Heuts P., & Lysens R. (1999). Pain-related fear is more disabling than pain itself: evidence on the role of pain-related fear in chronic back pain disability. *The Journal of International Association for the Study of Pain*. 80(1), 329-339. [http://doi.org/10.1016/S0304-3959\(98\)00229-2](http://doi.org/10.1016/S0304-3959(98)00229-2)
- [3] Donzelli, S., Domenica, F., Cova, A.M., Galletti, R. & Giunta N. (2006). Two different techniques in the rehabilitation treatment of low back pain: a randomized controlled trial. *European Journal of Physical and Rehabilitation Medicine*. 42(3), 205-210.
- [4] Elflein, J. (2019). *Percentage of adults in the U.S with low back pain in 2000 and 2016, by age group*. <https://www.statista.com/statistics/188862/adults-in-the-us-with-low-back-pain-by-age/>
- [5] Lee J. S & Kang S. J. (2016). The Effects of Strength Exercise and Walking on Lumbar Function, Pain Level, and Body Composition in Chronic Back Pain Patients. *Journal of Exercise Rehabilitation*. 12(5), 463-470. <http://doi.org/10.12965/jer.1632650.325>
- [6] Shnayderman, I., & Katz-Leurer, M. (2012). An aerobic walking programme versus muscle strengthening programme for chronic low back pain: a randomized controlled trial. *Clinical Rehabilitation* 27(3), 207-214. <http://doi.org/10.1177/0269215512453353>
- [7] Suh, J.H., Kim, H., Jung, G. P., Ko, J. Y., Ryu, J. S. (2019). The effect of lumbar stabilization and walking exercises on chronic low back pain. *Medicine* 98(26), e16173. <http://doi.org/10.1097/MD.00000000000016173>
- [8] Winett, R. A. & Carpinelli, R. N. (2001). Potential health-related benefits of resistance training. *Preventative Medicine* 33(5) 503-513 <http://doi.org/10.1006/pmed.2001.0909>

# How School Type Influences Enrollment and Preference

Carley Newbill

*B.A. Candidate, Department of English, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

Received 16 April 2021; accepted 20 July 2021

---

## Abstract

Public, private, and charter schools are all present within the United States of America; however, they have many differences between them that make it natural to compare the three. By doing so, it is possible to see the various pros and cons, and to examine which school parents and students prefer, and the reason or reasons why. By answering this question, it is possible to see what makes a school appealing from the parents' and students' perspective and to see if any of the positives of one type school could be implemented into others. It was first believed that public schools were the most popular school and the one most parents and students would choose due to their accessibility and size. This study was completely quantitative, as no additional surveys or experiments were conducted. The results of this study found that while public schools are indeed the school most parents and students prefer, the reasons behind it were different than anticipated. Parents consider their own socioeconomic status and the school's distance from home when deciding where their child should attend.

*Keywords: Public schools, private schools, charter schools*

---

## Introduction

The first public schools in the United States of America were created in 1635, and they have remained in the nation ever since. Since then, however, other types of schools have been created, such as private schools and charter schools. It is natural, then, to compare the three in various ways. This could be through comparing the specific curriculum differences, or by looking at how schools are structured and what benefits or disadvantages these create. However, it is also important to look to those attending these schools and those directly involved with decided which school their child should ultimately attend. Between public, private and charter schools, which do parents and students prefer attending, and why? Based off of my own prior knowledge, that public schools vastly outnumber private and charter schools, I believed that public schools would be the school parents and students prefer when compared with private and charter schools.

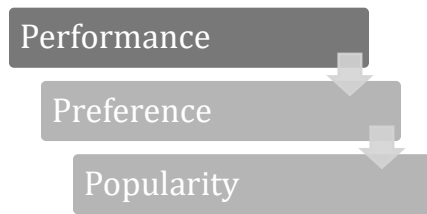
It is important, first and foremost, to note and explain the differences between public, private, and charter schools. Public schools are funded by the public through the government, that being through taxpayers. Private schools, on the other hand, are privately funded and have no connection with the federal government. Charter schools can be viewed as the middle ground between public and private schools, as they are still separated from the government, but they can be associated with various organizations at different levels. In fact, charter schools are often described as being less constrained than public schools (Zimmer 2003). Of course, other minor differences may be present depending on the exact curriculum being taught at a particular school, but that is dependent on the area and varies by state. Therefore, the definitions listed above will be treated as the core differences between all three schools. However, there are more similarities between charter and private schools than public schools. In fact, both private and charter schools are described as having more autonomy than public schools (Gawlik 2016). This autonomy does not only apply to the students, as many teachers feel as though they

have more freedom within private and charter schools than public schools (Özdemir 2019). Even though private and charter schools are distinct entities, they are often grouped together when describing the differences between them and public schools. Of the two, however, private schools are the entity typically paired against public schools, while charter schools are often left out of the argument entirely. My study puts charter schools on equal footing with public and private schools, as it is still a viable school option within the United States.

Another core focus of this study is what I eventually dubbed the "Three P's". The "Three P's" are performance, popularity, and preference, and all of these words relate to three main questions about the schools themselves or parents and students. For performance, the question is: does a school's average test scores positively influence attendance? For popularity, the question is: which type of school has the most physical locations in the United States? Finally, for preference, the question is: which school do parents and students prefer over other schools, and why? This final question relates back to the entire purpose of this study, but the other two are just as important as well. At the start, just as I believed that public schools would be the school of preference for the majority of families, I believed that performance would be one of the most important factors parents looked at when decided which school their child should attend. This was done under the belief that parents would want their children to attend the best school possible. The hierarchy that the "Three P's" and their associated questions were put under are: performance, preference, and popularity (see Figure 1). While the three concepts relate to one another and the overall concepts associated with my study, more attention was put on performance. Again, these key words and questions were driving factors in what I was looking for when the study first began.



Figure 1.



## Methods

The goal of my study was to observe already existing trends and gather research that has already been conducted in order to compare and contrast that data. As such, no surveys or other experiments were conducted for this study, as all of the information needed already existed. It was just a matter of researching this topic, finding that information and data, and coming to a particular conclusion based on that information. Most of the information gathered revolved around understanding not only what makes the three schools unique, but in seeing what the most common praises and criticism are currently being said about all of the schools as well. As such, this was a completely quantitative and archival study.

While a survey was briefly considered at the inception of my study, I determined that the survey would not be the focus of the study and would only serve in a supportive capacity and would not add any substantive to the study as a whole; therefore, it would not be worth it to conduct a study. It proved to be more fruitful to study various databases and look for existing data and journals that address this issue, and then I would compile this information and connect them to one another. No additional information was created for the purpose of this study; therefore, more focus was given on making sure the information that was gathered was necessary in what it had to say and adding to the overall study.

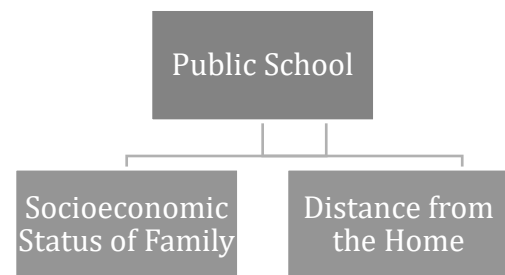
## Results

The main purpose of this study was to not only see which school parents and students prefer among public, private, and charter schools, but to examine the reason or reasons behind this preference. Public schools, at the beginning of this study, were anticipated to be the most popular school due to their accessibility and size. This assumption and belief are true, public schools are what most parents and students prefer, but not for the reasons that were first anticipated. In fact, while public schools are indeed the school that, on average, people prefer over private and charter schools, the reasons behind this preference are the most interesting discovery of this study.

There are two main factors that make public schools more appealing to families: the school's distance from the home and their own current socioeconomic status (see Figure 2). While parents do look at how well a school performs, this is not the deciding factor in the school choice decision. The socioeconomic status of the family almost always dictates where that family will choose for their child to attend, as there is often no choice for families of middle and low socioeconomic statuses (Burgess 2015). Most families in the U.S.A. reside in the middle class, and the average middle-class family cannot afford for their child or

children to attend private or charter schools, as these two types of schools require tuition payments. There are exceptions in the form of scholarships or waivers, but, on average, private and charter schools are more expensive for students to attend. This is especially true in comparison to public schools, which are free for students to attend. Public schools are publicly funded by the government and are authorized by a local or state agency (CA Dept of Education). No matter where it is located in the U.S., a public school cannot turn students away and families are not required to pay tuition. Families that have a high socioeconomic status have more freedom and choice over where their child or children attend school, while families with a low socioeconomic status have the least amount of freedom and choice. For many, public schools are the only choice because it is the only option they can afford.

Figure 2.



The other main factor is distance from home, a factor that was not considered at the beginning of the study. Put simply, parents prefer schools that are located close to their home for ease of access (Burgess 2015). A parent does not want to have to drive an hour or more in order to drop their child off at school if they have a choice. This is also what makes public schools more appealing, as public schools vastly outnumber both private and charter schools combined. It is more likely for a community to have several public schools than multiple private or charter schools. This also goes back to the idea of some families not having a choice over what school their child can attend. If a middle-class family can afford for their child to go to a private or charter school, depending on how close either of those schools are to the home, the family would still choose for their child to attend public school if it is significantly closer to the home. It also depends on the size of the city the family lives in as well, as a small town is more likely to only have public schools while a large city could have multiple private or charter schools. Distance from home is a factor that works in conjunction with other concerns, but it still acts as a deciding factor in the school choice process.

I found that, although there exists dissatisfaction with public schools and the various ways they are run, public schools still find favor with the overall public despite the existence of alternatives. In fact, dissatisfaction with public schools was listed as one of the main reasons behind why students switch to charter schools (Gawlik 2016), but "dissatisfaction" is not defined or expanded on. The main positives associated with both private and charter schools is the concept of autonomy and how public schools are

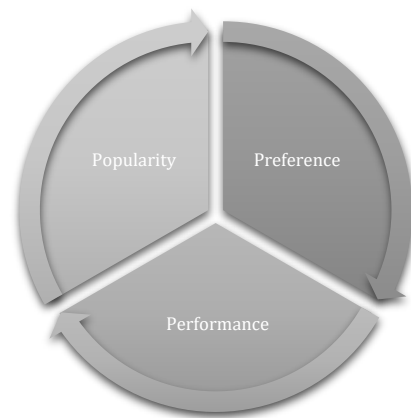
restrictive by comparison. Even from the teachers' perspectives, they felt as though they had more freedom in private schools than public schools (Özdemir 2019). Yet, because of the nature of private and charter schools, it is difficult to find consistency between schools due to how distinct and different each school can feel from one another, even when they are of the same school type. The main reason students switch to private and charter schools is not because these schools have positive characteristics, but because they are unhappy with their current public schools. However, this is a minority of children, as the vast majority of students will attend public schools despite any issues they may have with the school. The California Department of Education (CDE) projected that 56.4 million students would be attending school in the fall of 2020, and of those 56.7 million, only 5.7 million of those students would be attending private school (NCES). Despite the overall perception of public schools falling behind or lacking the resources private and charter schools have, it is clear from the data that the majority of the population, likely due to the factors listed previously as determining factors, stay with public school and choose it over private and charter.

Another detail, however minor, that was made apparent during my study that could influence a family's decision is IDEA, or the Individuals with Disabilities Education Act. IDEA ensures that students with disabilities are guaranteed certain rights, such as the right to a "free and appropriate public education" as well as an "individual education plan" (Farrell & Marx 2018). This can be seen in every public school being required to have handicap ramps, or them having to provide the appropriate resources for a student who is blind or deaf. Only public schools, however, are required to provide a "free and appropriate" education under this law. Private and charter schools are not required by law to follow IDEA and could theoretically discriminate against students with disabilities. This does not mean that private and charter schools will not or cannot accommodate students, or that they will not accept students into their schools because of a disability, but these are some of the fears parents of children with disabilities have towards private and charter schools. This is a reservation about private and charter school that was not anticipated, but it helps to further explain how public schools benefit from its connection to the government and federal law.

It is also important to note the accuracy, or lack thereof, of the "Three P's". Performance was anticipated to be one of the most important factors in the school choice factors, if not the deciding factor. While it is true that parents do indeed look at how well a school performs when examining various schools, in no way is performance a determining factor. As mentioned previously, distance from home and current socioeconomic status remain the two most important deciding factors parents look at when choosing which school they want their child to attend. Of course, if there are two public schools that are close to the home and one of them performs better on average, then performance would become a more important factor, but it is not as universal as the other two factors listed. Referring back to the "Three P's", it is clear that performance, popularity, and preference are more interconnected than first anticipated, and that performance is not the most important of the three.

A more accurate representation of the "Three P's" would feature preference, popularity, and performance as relating to one another and being viewed as relatively equal, rather than one being superior than the others (see Figure 3). This is not to say that performance is not an important measure, however. In fact, there is a positive correlation between a fall in public school academia performance and a rise in enrollment in private schools in specific areas. In addition, in areas where there are no private or charter schools, public schools are shown to have a higher performance rate (Marlow 2010). Overall, it depends on the context in which performance is being viewed and the other variables associated with it as well.

Figure 3.



### Conclusion

In conclusion, the hypothesis that public schools are the most popular schools within the U.S. when compared to private and charter schools is correct, even if the reasons are different from what was anticipated. Even if a family examines how well a particular school performs, their socioeconomic status and how close the school is from the home are the two most important determining factors for the average family. For most families, public schools are often the only choice in schools that they have, and they are the most appealing due to the fact that public schools are free for students to attend and they are required to accommodate students with disabilities through IDEA. Public schools are typically the first choice, while private and charter schools are attended if the student has an issue that cannot be resolved with the public schools.

### Discussion

Based on my results, it is clear that no immediate changes can occur in private or charter schools in order to make them more "appealing" to parents and students. In fact, it is because of their differences with public schools that people attend these two schools in the first place. While public school may be the first choice in many cases, it is not the only choice, and issues and other errors can still occur. As mentioned previously, many of the journal articles and research I found painted public schools in a negative light, or, at the very least, favored private or charter schools for various reasons. No one type of school is perfect, but it is important to examine why students choose to attend one over another because it might help shed light on what students and parents prefer in the education process.

For as much negative attention public schools get, the positives, in many people's eyes, outweigh any of the negatives. The fact that public schools are completely free to attend is a huge boon, especially for families of lower socioeconomic statuses. It is wrong to glance over this fact and act as though paying no tuition for public schools is not reason enough to attend it. It is also for the majority of an individual's educational career that they can receive free public education, as well, as it takes place throughout K-12. Therefore, receiving a free education this entire time can make a large difference in an individual's life depending on various personal factors. These elements may seem like minor ones, but there is a reason why public schools have persisted for so long, even while under great scrutiny.

There is no easy or immediate fix to any of the issues that surface about any of the three schools, as the negativity these schools receive are due to the differences, they have with one another. When I first thought about how to make these schools better, I understood that any changes would not be easy, but that they would still be possible depending on the exact issue. However, when those issue involves the exact structure of the school, it is difficult to change. As mentioned previously, students typically attend private and charter schools due to dissatisfaction with public school. The reason they attend private and charter schools is because they are inherently different than public schools.

The most unexpected findings of this study revolved around IDEA and the hesitancy some parents have about letting their child attend private or charter schools. While this concern may be a minor one, it shows that there are many different factors that families have to consider, and some families have more to consider than others. Therefore, public school is a good choice for most families simply because it covers the most ground and is designed to accommodate all kinds of students, making it more general than private or charter schools. Private and charter schools can be associated with specific organizations or religions, but public schools cannot. Even though some families may like how specialized private and charter schools can be, this scares off other families who need reassurance that their child will be taken care off and receive the best education possible.

## References

- [1] Burgess, S., Greaves, E., Vignoles, A., & Wilson, D. (2015). What Parents Want: School Preferences and School Choice. *Economic Journal*, 125(587), 1262–1289.
- [2] Gawlik, M. A. (2016). The U.S. Charter School Landscape: Extant Literature, Gaps in Research, and Implications for the U.S. Educational System. *Global Education Review*, 3(2), 50–83.
- [3] Farrell, I., & Marx, C. (2018). The Fallacy of Choice: The Destructive Effect of School Vouchers on Children with Disabilities. *American University Law Review*, 67(6), 1797–1909.
- [4] Marlow, M. L. (2010). The influence of private school

enrollment on public school performance. *Applied Economics*, 42(1), 11–22.

- [5] Özdemir, G., & Şahin, S. (2019). Autonomy in the Workplace: A Comparative Study of Public and Private Schools. *International Journal of Eurasia Social Sciences / Uluslararası Avrasya Sosyal Bilimler Dergisi*, 10(38), 1176–1188
- [6] Zimmer, R. W. (2003). *Charter school operations and performance: evidence from California*. Santa Monica, CA: Rand.
- [7] Definition of a School. Definition of a School - County-District-School Administration (CA Dept of Education). (n.d.). <https://www.cde.ca.gov/ds/si/ds/dos.asp>.
- [8] The NCES Fast Facts Tool provides quick answers to many education questions (National Center for Education Statistics). National Center for Education Statistics (NCES) Home Page, a part of the U.S. Department of Education. (n.d.). [https://nces.ed.gov/fastfacts/display.asp?id=372#PK12\\_enrollment](https://nces.ed.gov/fastfacts/display.asp?id=372#PK12_enrollment).

# The Effects of Attentional Focus in Fine Motor Skill Learning

Georgina Orozco

*B.S. Candidate, Department of Exercise Science, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

Received 16 April 2021; accepted 20 July 2021

---

## Abstract

The goal of attentional focus studies is to identify whether internal (IFA) or external focus (EFA) are more effective in improving motor learning or performance on tasks. External focus relies on focusing on the effect of the movement whereas, internal focus relies on focusing on the body movements directly (McNamara et al., 2017). Previous attentional focus studies conclude that better performance is achieved with an external focus of attention (Wulf, 2013). The goal of this study is to study whether external or internal focus of attention provides a more suitable outcome when performing a fine motor skill task without vision. Sixteen right-handed participants conducted a finger movement task without vision in the control, external focus, and internal conditions. Errors (i.e. omitted keys, wrong sets, and repeated keys) and preferred attentional focus during practice trial were recorded. Participants in the external focus of attention condition generated less error ( $p < .05$ ) compared to the internal focus of attention. In the control condition 56.25% participants preferred external focus of attention and 43.75% preferred internal focus of attention. A t-test was run to determine whether there was a significance between the control condition and the last trial in both EFA and IFA and established that participants generated less error as the trials progressed ( $p < .05$ ). The t-test suggests that motor learning may occur. This is impactful because there are minimal attentional focus studies that emphasize on fine motor skills. The use of attentional focus during the instruction of exercise should be further explored.

---

## Introduction

Effective motor performance is imperative in everyday activities such as athletic skills, exercise and rehabilitation (Lohse et al., 2014). External focus relies on the effect of the movement whereas (i.e. pressing the correct key), while internal focus involves body movements (i.e. moving the fingers) (McNamara et al., 2017). The use of external focus of attention has shown significantly better performance in athletic tasks such as golf, tennis, soccer, darts and volley compared to the internal focus of attention and control condition (Lohse et al., 2014). External focus of attention has also exhibited benefits in the clinical setting with patients recovering from a stroke, balance, Parkinson's disease or musculoskeletal injuries (Lohse et al., 2014).

The explanation as to why external focus leads to better performance can be explained by the "external focus effect" otherwise known as the constrained action hypothesis (Wulf, 2013). First presented by Wulf (2013), the constrained action hypothesis explains that internal focus leads to a more conscious type of control which leads to the interruption of the automatic control process (Wulf, 2013). External focus pushes for a more automatic mode of control which leads to a fast and spontaneous control process (Wulf, 2013).

In McNamara et al.'s study (2017), children with moderate and profound visual impairments performed a balancing task that involved standing on a stability platform. The purpose of this study was to determine how an internal focus and external focus of attention affect the balance performance of children with visual impairments (VI). The results revealed that the benefits of external focus of attention may be dependent on the severity of visual impairment. Children with moderate VI had less error and more automated processing when using an external focus, which supports widespread results from previous attentional focus research. Those with profound

VI did not experience an external focus benefit. McNamara et al.'s study is beneficial because it defies some of the previous studies by showing that the "external focus effect" might not benefit children who are profoundly visually impaired.

However, the current literature on attentional focus without vision is not consistent. A study done by Abdollahipour et al. (2016) found that taking vision away from non-visually impaired participants still resulted in an external focus benefit. Abdollahipour et al.'s study examined whether vision influences the effect of attentional focus on the performance of body movements through space. Twenty-four college student participants were required to perform a maximal standing two-legged vertical countermovement jump with arm swings. In order to record the height of the jumps, an optoelectronics measurements system was used. The participants performed three trials under each attentional focus condition with vision and without vision. Trials with vision were statistically better than during trials without vision. The trials performed using external focus of attention were statistically better than those performed with internal focus of attention. However, the task used to examine the external focus effect in the Abdollahipour et al. study was a quick, discrete task, one that required maximum force production, and was not heavily reliant on either proprioceptive or visual sensory information nor was it a task that required accurate movements.

In Rossetini et al.'s study, motor performance during finger movement was studied. Ten healthy right-handed participants performed a finger movement task in control, EFA, and IFA. Rossetini et al. suggests that Duke et al. provide initial evidence that EFA compared to IFA is more effective to determine an improvement of the accuracy of playing a passage at the music keyboard. Rossetini et al.'s study consisted of the QWERTY keys on the keyboard being masked with a plastic cover leaving

free only 5 keys (F, T, Y, U, and K). The task was to press all five fingers of the right hand twenty times on the keyboard's keys in the following sequence: thumb, index, middle finger, annular, little finger; thumb, middle finger, little finger, index, annular; little finger, annular, middle finger, index, thumb; little finger, middle finger, thumb, annular, index. Each finger was paired with a single key and the contact between finger and key had to be maintained during the whole task. A digital metronome program guided the sequential execution of the fingers' movement. The 1 Hz frequency of the metronome determined the speed of execution. Subjects performed in three conditions (control, IFA, and EFA). The order of the IFA or EFA condition was counterbalanced for all participants to control for order effect. A text file was used to record and check the task errors (TE) (i.e. omitted keys, wrong sets, and repeated keys). The main findings were that verbally instructed EFA produces better performance due to a reduced number of errors compared to IFA and control. 70% of participants adopted IFA, 10% adopted EFA and 20% adopted a mixture of both.

## Methods

### Subjects

Participants were sixteen right hand dominant students from California State University, Stanislaus. There were nine males and nine females ages (Mean age = 21,  $SD = \pm .704$ ). The participants were recruited with a convenience sampling survey. In order to qualify to be a part of the study the participants were screened to ensure that they had adequate finger range of motion and that they had no expertise playing any musical instruments. The participants completed a series of finger range of motion (ROM) exercises to assess adequate finger flexibility to take the place of a goniometer test. Stanislaus State's Institutional Review Board approved the research and an informed consent was obtained from the participants electronically.

### Task

The participants submitted the survey and their consent form prior to any examination. As a result of the social distancing guidelines, participants performed the task via Zoom to ensure the safety of the investigator and the participants. The participants used their own laptops which resulted in a variety of different brands being used. The typing task required that the participants position their fingers of their right hand on the asdf keys of the left side of the keyboard. The home position throughout the experiment was: the index finger on the a key, middle finger on the s key, annular finger on the d key and the pinky finger on the f key. Vision was eliminated with sleeping masks, beanies, or scarfs. There was a total of twenty keystrokes per trial for a total of 6 trials in each condition. There were five sets of 4 keystrokes for an accumulation of twenty keystrokes per trial. The subjects were to keep their fingers on the designated home position. To pace the speed of the execution a 1hz, 60 BPM metronome simulator from YouTube was used. There were four reactions produced by the metronome and each sound indicated a finger movement for each of the four fingers

involved. Every time the metronome reacted the subjects moved to the next finger and completed the appropriate set.

The first set required each finger to move up one key from the home position. The second set required the fingers to move down one key from the home position. The third set required subjects to alternate up one key and down one key from the home position. Starting with the index finger going up one key, the middle finger down one key, the annular finger up one key and the pinky finger down one key. The fourth set required the fingers to stay on the home keys and press down on the keys in the following sequence: pinky, annular, middle, and index. The fifth sequence required the fingers to alternate going down a key and the next finger going up a key until that sequence was completed. The index finger moved down one key, the middle finger moved up one key, the annular moved down one key and the pinky moved up one key.

**Figure 1:** This keyboard shows the highlighted keys that were used in this study.



### Procedure

This was a within subject design study where all subjects performed under three conditions which included control, IFA and EFA. The control condition provided practice for the subjects to run through each of the five sets of tasks. There was no attentional focus instruction during the control condition. During the control condition the participants practiced each of the sets and verbally explained what each of the sets required them to do. For example, "in set one when the metronome goes off, I will move up key from the home position for each of the fingers involved". The purpose of the practice was to teach the participants what each of the sets stood for and to get used to executing the task at the speed of the metronome. After the control condition the participants were asked to state what they were focusing on. The most common responses were "I was focusing on the sound of the metronome (EFA)", "I was focusing on typing the correct set (EFA)", "I was focusing on my finger movement (IFA)", and "I was thinking of my finger placement (IFA)". The responses were put into either the IFA condition or EFA condition category depending on the response that the participant gave in order to assess what attentional focus they had adopted. Anything that related to body movements was coded as IFA (i.e. finger movement) and anything that related to the effect of the task (i.e. the correct sequence) was coded as EFA. There was a six second pause between each set and a two-minute pause between each condition.

After the control condition the investigator provided attentional focus instructions. The order of the IFA or EFA conditions were counterbalanced for all participants to control for order effect. Subjects were told to focus on their finger movements during the internal focus of attention condition. “Please focus on the movement of your fingers.” In the external focus of attention subjects were told to focus on the effect of the movement which was pressing the correct keys. “Please focus on the target keys and the sequence.” The participants typed into a google document that was provided by the investigator in order to record the data. The document had divisions between the trials and conditions. After each trial the subjects were asked to find the down arrow in order to move onto the next section of the document. The five sets of typing tasks were completed for each trial. The investigator verbally cued the participants as to what set to type.

### Analysis

Descriptive analysis was used to measure subjects’ mean age and the preferred focus of attention during the control condition. Errors produced during the trials (i.e. wrong key, wrong set, omitted keys etc.) were assessed by a one-way repeated measures ANOVA with “trial” and “condition” as within subject factors. The statistical significance was set as  $p < 0.05$ . A t-test was used to determine if there was a significant difference between the practice trial (control condition) and the last trial from both the internal and external condition.

### Results

In order to assess whether there were any significant differences between the two attentional focuses and between the six trials an ANOVA within subject effects was run on the data. The within subject effects test resulted in a p-value of 0.037 for the focus when set at  $p < 0.05$  with an f-value of 5.246. The p-value of 0.029 was also statistically significant for the trials when set at  $p < 0.05$  with an f-value of 2.658. The significant difference between the trials indicates that participants in the EFA condition performed better compared to the performance in the IFA. The significant difference found in the test run on the trials suggests that there was a difference in performance from the beginning of the test to the last trial.

The mean error scores were calculated for each participant with the corresponding trial under both conditions. The total number of task errors were lower in the external focus of attention ( $M = 2.09$ ,  $SD = 2.33$ ) compared to the internal focus condition ( $M = 2.968$ ,  $SD = 2.74$ ). This indicates that overall participants produced less error in the EFA condition. The mean error scores for each participant in the control trial (practice trial) was used to determine whether there was an improvement from the practice trial to the last trial of each of the two conditions ( $M = 4.375$ ,  $SD = 2.25$ ). The average errors for the last trial of the external focus was 1.75 errors and 1.875 errors for the last trial under internal focus. The mean error scores suggest that there was an improvement in both of the conditions when comparing the practice trial to the last trial

in both conditions. This indicates that motor learning may have occurred.

**Graph 1:** The graph below represents the mean errors generated under the EFA and IFA condition for each of the six trials.



In graph 1, mean error scores and the six trials were graphed in order to show the difference between the two attentional focus within each trial. The external focus of attention condition shows significantly less error being generated compared to the internal focus of attention (i.e. EFA trial one 2.81 errors, IFA trial one 3.44). The fact that there is no interaction between the two conditions indicates that the participants improved in both conditions. The improvement in both conditions can also be seen by considering the mean error scores in trial six (EFA = 1.8125, IFA = 1.9375). The relatively close mean error scores in trial six may explain a possible practice effect in the internal focus condition and a floor effect in the external focus of attention condition. After coding the participant’s preferred external attentional focus during the control condition 56.25% of participants adopted external focus of attention and 43.75% of participants adopted internal focus of attention.

**Table 1:** The t-test results of the comparison between the performance in the practice trial and the last trial in the external focus condition and the comparison of the practice trial and the last trial in the internal focus of attention condition.

|                                |            |
|--------------------------------|------------|
| Practice trial vs trial six EF | $p < 0.05$ |
| Practice trial vs trial six IF | $p < 0.05$ |

A t-test was run to compare the errors generated in the practice trial and the last trial of the external condition. As well as the practice trial and the last trial in the internal focus condition. The p-values for both of the t-test suggest that participants improved their performance in these fine motor tasks. A significant p-values suggests that motor learning may have occurred and for this reason the participants improved.

### Discussion/Conclusion

The purposes of this study were to assess whether there was a benefit to using external focus of attention in an attentional focus task using fine motor muscles without vision. Also, to determine whether motor learning would occur and to investigate whether participants would adopt external focus during their practice trial. The results suggest that verbally instructed external focus of attention

leads to less error being generated (i.e. wrong key, wrong set, omitted keys etc.) in this fine motor learning task. These results support and expand on Rossetini et al.'s findings.

The within subject effects test resulted in a significant p-value for both attentional focus and trial. This leads to the conclusion that when participants performed the task with EFA instruction, they performed better in all of the trials compared to in the IFA condition. The mean error scores calculated for each trial under both attentional focus conditions supported the hypothesis that EFA would lead to less errors being generated. The mean error scores suggested that participants produced approximately one error more in each trial using IFA compared to EFA. To test whether motor learning occurred the mean error score was computed for each participant's practice trial. The mean error score from the practice trial was compared to the last trial in the EFA condition and the IFA condition. The findings suggested that participants considerably improved from their practice trial to the last trial under both conditions. This was confirmed by the t-test run on both the practice trial and the last trial of the EFA condition and IFA condition. This implies that motor learning may have occurred.

There is no interaction between the focus and the trial which means that participants improved in both of the conditions and as the trials continued. A floor effect may have occurred after the fourth trial in the EFA condition due to fatigue. After the fourth trial the participants appear to not get any better. In the IFA condition on the other hand there appears to be a possible practice effect. After trial four participants continue to get better. Once trial six was reached the mean error scores were almost the same which implies that attentional focus may be disregarded due to possible fatigue.

The explanation of why external focus leads to better performance may be due to the constrained action hypothesis. The constrained action hypothesis concludes that participants in the EFA condition reacted with a more automatic control process compared to the IFA condition. Meaning that there was less hesitation and thought when executing an action with EFA. It is assumed that the participants that performed in the IFA condition produced more error due to having a more conscious control during the execution of the tasks (Wulf, 2013).

### Limitations

According to the methodology adopted by Rossetini, we adopted sets of tasks that were increased in difficulty and eliminated vision. The fact that this study was performed in an online setting came with several limitations. Ideally, all participants would have used the same laptop, but the participants used their personal laptops due to distance guidelines. Although it is not common, some of the keyboards varied which may have led to inaccurate results due to different setups. There were also difficulties regarding not being able to hear the beats of the metronome clearly which played a vital role in the execution of this study. Not hearing the beats could have led to omitting keys or starting the typing execution late. The eye coverings differed which may have enabled some

of the participants to see their keyboard. Not being able to see where the participant's fingers were placed was a key limitation due to the fact that if they were placed on the wrong keys to begin with then that led to the entire set to be incorrect.

The length of the trials may have led to a practice effect and a floor effect. This study included six conditions with five sets of tasks in each of the two conditions which may have been repetitive and could have led to fatigue. Future researchers should recruit a larger sample size and design a study with fewer trials in each of the conditions. It would be ideal to perform this study in person due to the limitations that could have been avoided.

### Acknowledgements

I would like to thank the Ronald E. McNair Program for providing me with the opportunity to conduct research as an undergraduate and for funding my research. As a first-generation college student navigating college can be a difficult process. The McNair Program has provided the resources necessary to succeed and to prepare for graduate school. I would also like to thank the McNair Program director Araceli Garcia for her advice and guidance. As well as Becky Temple who contributed with the UIRB and the participant recruitment process.

I would like to thank my mentor Dr. Alami for working with me in this research and teaching me about the research process. Dr. Alami is also my major advisor and has guided me through difficult times. Dr. Bell contributed to the beginning stages of my research. Dr. Bell's kindness and encouragement allowed me to persevere through the difficulties that came with planning a research project during a pandemic. Dr. Newton has also contributed to this research by providing feedback and advice. Dr. Newton was a major contributor to my capstone presentation.

### References

- [1] Abdollahipour, R., Psotta, R., & Land, W. M. (2016). The Influence of Attentional Focus Instructions and Vision on Jump Height Performance. *Research Quarterly for Exercise and Sport*, 87(4), 408–413. <https://doi.org/10.1080/02701367.2016.1224295https://pubmed.ncbi.nlm.nih.gov/27636712/>
- [2] Chiviacowsky, S., Wulf, G., & Wally, R. (2010). An external focus of attention enhances balance learning in older adults. *Gait & Posture*, 32(4), 572–575. <https://doi.org/10.1016/j.gaitpost.2010.08.004https://www.sciencedirect.com.libproxy.csustan.edu/science/article/pii/S0966636210002286>
- [3] Duke, R. A., Cash, C. D., & Allen, S. E. (2011). Focus of Attention Affects Performance of Motor Skills in Music. *Journal of Research in Music Education*, 59(1), 44–55. <https://doi.org/10.1177/0022429410396093http://web.a.ebscohost.com.libproxy.csustan.edu/ehost/detail/detail?vid=1&sid=a05c72bf-2540-4753-b42f-1dac41b1523c%40dc-v->

sessmgr03&bdata=JnNpdGU9ZWhvc3QtbGl2ZSZz  
Y29wZT1zaXRl#db=aph&AN=61093825

- [4] Lohse, K. R., Sherwood, D. E., & Healy, A. F. (2014). On the advantage of an external focus of attention: A benefit to learning or performance? *Human Movement Science*, 33, 120–134.  
<https://doi.org/10.1016/j.humov.2013.07.022>  
[https://www.sciencedirect-com.libproxy.csustan.edu/science/article/pii/S0167945713001061](https://www.sciencedirect.com.libproxy.csustan.edu/science/article/pii/S0167945713001061)
- [5] McNamara, S. W., Becker, K. A., & Silliman-French, L. M. (2017). The Differential Effects of Attentional Focus in Children with Moderate and Profound Visual Impairments. *Frontiers in Psychology*, 8.  
<https://doi.org/10.3389/fpsyg.2017.01804>  
<https://www.frontiersin.org/journals/psychology>
- [6] Rossetini, G., Testa, M., Vicentini, M., & Manganotti, P. (2017). The Effect of Different Attentional Focus Instructions during Finger Movement Tasks in Healthy Subjects: An Exploratory Study. *BioMed Research International*, 2017, 1–7.  
<https://doi.org/10.1155/2017/2946465>  
<https://www.hindawi.com/journals/bmri/2017/2946465/>
- [7] Wulf, G. (2013). Attentional focus and motor learning: a review of 15 years. *International Review of Sport and Exercise Psychology*, 6(1), 77–104.  
<https://doi.org/10.1080/1750984x.2012.723728>  
<https://www.tandfonline.com/doi/abs/10.1080/1750984X.2012.723728>



# Am I Worthy? The Relationship between Weight and the Perception of Intelligence, Perceived Confidence, and Perceived Relationship Status

Tawny Ortega

*B.A. Candidate, Department of Psychology, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

Received 16 April 2021; accepted 20 July 2021

---

## Abstract

The purpose of this study was to examine factors pertaining to weight stereotyping and the perception of intelligence, confidence, and the likelihood of relationship status. It was hypothesized that participants who view images representative of magazine models will rate those individuals as more intelligent, more confident, and more likely to be in a relationship, as compared to those who view images representative of the regular everyday individuals. A sample of 37 undergraduate students from CSU Stanislaus were asked to complete the Perceived Intelligence Scale, the Relationship Status Questionnaire, and the Perceived Confidence Scale. Results indicated that no significant differences were found between the groups relative to intelligence, likelihood of being in a relationship, and confidence. The researcher's hypotheses were not supported. These findings may have been limited by a small sample size and by the COVID-19 pandemic causing all classes to be performed online, as well as the restrictions of data collection from only an undergraduate population. Ultimately, this study allows for replicability and can be applied in various settings and to various target populations for future research purposes. Future research should focus on possible solutions to help combat the ideology set by individualist cultures and educate more people on weight-based stereotyping.

*Keywords: Weight Stereotyping, Body Image, Culture*

---

## Introduction

We live in a culture where the human body is reduced down to simplistic measures, either you are fat or thin, fat is out and thin is in (Blake, 2020). The topic of weight stereotyping is one that is prevalent in our society and has caused a divide in how we view and label people. The cause of weight stigmatization is complex, there is not one single factor that influences our perception of others, but different factors that overlap. The factors highlighted in this present study are: 1. body standards set by society, 2. cultural issues, 3. biological issues, 4. economic issues, and 5. proposed solutions.

The first factor, body standards set by society, elaborates on the ideal body type, and what physical attributes are deemed attractive or unattractive, and also states the negative consequences individuals face if they do not fit into societal standards (Blake, 2020; Bleske-Rechek et al., 2014; Cossrow et al., 2001; Harris et al., 1990; Swami et al., 2008). The second factor is cultural issues. Arauz et al. (2002) examined how culture influences our perception of food. The researchers indicated that an individualistic culture has a negative relationship with food, because of the pressure to fit into societal standards, whereas a collectivist culture has a positive relationship with food, because it's associated with bonding and family time. The third factor is biological issues. In our society we tend to forget that there are other factors that influence an individual's ability to lose weight. Certain underlying health conditions can hinder weight loss or even cause individuals to gain weight (The National Health Service, 2020). In addition, The National Institute of Diabetes and Digestive and Kidney Diseases (2015) states that metabolic differences in individuals make it difficult to lose weight. The fourth factor is economic issues, eating healthy is expensive and many people cannot afford it. Drewnowski and Eichelsdoerfer (2017) examined

USDA-designed food plans and stated more consideration is needed for families to be able to buy affordable healthy food options. Lastly, the fifth factor addresses proposed solutions to help combat weight stereotyping. It is important to embrace body positivity and also educate people about different body types (Brah, 2020; Sonnevill & Bauer, 2018). By examining all these factors, the hope is to create a society where people are less focused on the physical attributes and become educated on the factors that influence body type.

## Body Standards Set by Society

Past research has determined that men and women who are overweight find it more difficult to find jobs and experience weight-based discrimination (Harris et al., 1990). It is socially acceptable to form stereotypes, negative attitudes, and biases towards overweight individuals, despite the damaging impact this has. Using a qualitative methodology, Cossrow et al. (2001) recruited participants through advertisements and fliers in Minneapolis and St. Paul, Minnesota. A sample of 31 participants, 17 women and 14 men, ranging in ages from 18 to 54 years with various body mass indexes (BMI), were organized into six different focus groups that were categorized by gender. Once each participant was assigned to a focus group, each group engaged in a 1 hour and 15-minute discussion. Participants were also asked to complete a list of topic questions. The groups were able to freely discuss any topic related to weight discrimination, and all participants were given the opportunity to share their experiences. Results indicated that participants with higher BMI's reported that they were treated differently at home, among their friends and strangers, at work, and in health care settings.

Previous research has clearly supported the hypothesis that individuals who are overweight or obese

have a more difficult time obtaining the same opportunities as those who are considered to be of normal weight, nor are they treated with the same level of respect. Why are overweight people perceived negatively by society and what labels are commonly used to describe individuals? These questions were explored by Swami et. al (2008) who also examined stigmatization of overweight and obese individuals relative to how society's negative perceptions are forced onto a group. The researchers conducted two studies. In the first study, a sample of 130 participants, 75 females, 55 males, from a British university were shown 50 gray scale pictures of women wearing grey leotards and leggings. The faces shown of each female were obscure. The researchers included pictures of women who fell into the BMI categories of emaciated, underweight, normal, overweight, and obese. Each image was shown to the participants three times, and on the third time they were asked to rate each image on a 9-point Likert-type scale ranging from 1 (very unlikely to get teased, not at all lonely, not at all lazy) to 9 (very likely to get teased, very lonely, very lazy). In the second study, a sample of 80 participants, 40 males, 40 females, also from the same British university were shown 50 gray scale pictures of males, also wearing grey leotards and leggings. The faces of each male were also obscure. Each of the 50 images ranged in different BMI's and WCR's. Participants were asked to complete the same measurement scale as in the first study.

Results of study one indicated that participants rated women with normal body range BMIs to be teased less often and to be less lonely than women with lower or higher BMIs. However, women with higher BMI ranges were rated higher in laziness. Similar results were found in the second study in that participants perceived men with low WCRs and normal BMIs to be less lazy, less lonely, and less likely to be teased as compared to men with higher and lower WCRs and BMIs. In addition, BMI appeared to be the better predictor of ratings of laziness than the two other ratings and the ratings of physical attractiveness.

Bleske-Rechek et. al (2014) examined how a woman's face and body are independent predictors of full-body attractiveness. Three hypotheses were tested. It was first hypothesized that ratings of women's face-only attractiveness and ratings of women's body-only attractiveness would both independently predict ratings of their full-body attractiveness. Second, body-only attractiveness would predict full-body attractiveness more when women's bodies were clearly visible than when their body was covered up. Finally, waist-to-hip ratio and body mass index would be strong predictors of women's body attractiveness.

Two studies were conducted. In the first study, a sample of 86 females were recruited from both lower and upper-level psychology courses at a public university in the United States during the Fall of 2010. All participants were photographed wearing their own street clothes. They were then weighed, and measurements were taken of their waist, hips, and chest circumference. They were then asked to complete a questionnaire designed to assess demographic and anthropometric information, along with a variety of self-assessment scales. The full-body photographs were then cropped into both face and body shots from which three

slideshows were created: full-body, face-only, and body-only. A second sample of both male and female first and second year students enrolled in psychology classes at a large public university in the western United States were asked to rate the photos relative to how attractive they found the woman in the image as compared to other women her age using a 9-point Likert scale of measurement, with 1 being much less attractive and 9 being much more attractive. In the second study, a sample of 74 females were recruited from both lower and upper-level psychology courses at the same public university in the United States as the first study during the Fall of 2011. All participants were photographed wearing two-piece swimsuits. As in the first study, weight and measurements were taken and the same measurement scales were completed. These photographs were also cropped into face and body shots, and the same type of slideshows were created. A second sample of both male and female students at a large public university in the southeastern United States enrolled in psychology courses were asked to rate the photos relative to both physical attractiveness and sexiness using a 9-point Likert scale of measurement.

The results indicated that for study one, hypothesis one was supported (Face and Body as Independent Predictors of Full-Body Attractiveness) in that face and body ratings combined accounted for 82% of the variance in full-body ratings (Bleske-Rechek et al., 2014). In study two, hypothesis one was also supported in that face and body ratings combined accounted for 84% of the variance in full-body ratings. The second hypothesis (Contribution of Body-Only Ratings to Overall Attractiveness in Original Clothes Versus Swimsuits) was also supported in both studies in that body ratings showed more incremental utility for predicting full-body attractiveness ratings of women wearing swimsuits than of women wearing their street clothes. Finally, for hypothesis three (Body Shape and Size as Predictors of Body Attractiveness Ratings) both studies showed body measurements were linked to ratings of their attractiveness, although it was determined, that the type of clothing worn by each sample of participants played a factor in the assessments of body attractiveness.

The United States has unrealistic body standards that are black and white, either a person is considered to be ugly or attractive based on their weight (Blake, 2020). This has led to a cycle where praising people for losing weight can be harmful, because it reinforces the idea that being thin is the ultimate goal. Blake (2020) addressed this issue and discussed pop star Adele's weight loss and how people complimenting her reinforces fatphobic and societal beauty standards. Blake went on to explain how in our society there is either fat or thin and this has reduced the complexity of the human body into something simple. Blake concluded that Adele lost weight, but people do not understand the complexity behind it, the reasons why she lost weight, or how she went about losing weight. In our society we automatically view weight loss as a positive thing, but individuals could be dealing with health issues that cause them to lose weight or could be suffering from an eating disorder. By praising Adele's weight loss, it implies that her original weight was not beautiful, and creates this toxic message where thin is all that matters. This issue is one that

is prevalent in our society, our reinforced beauty standards put people in a box and views people as objects that are either worthy or not worthy.

### **Addressing the Cultural Issues**

Researchers have examined the relationship between cultural differences and attitudes towards food, as well as how these attitudes correlate to one's well-being (Arauz et al., 2016). The researchers were interested in looking at participants from both individualistic (Euro-Americans) and collectivist cultures (Costa Ricans), and examining three different food attitudes: 1. concern about gaining weight, 2. food negativity, and 3. the belief in the link between diet and health (Arauz et al., 2016). It was hypothesized that participants from the individualistic culture would be more concerned with losing weight, report higher levels of food negativity, and believe that diets help improve overall health, as compared to individuals from the collectivist culture. Two separate samples of participants were recruited from the University of Connecticut and the University of Costa Rica in San Jose through an online Psychology participant pool system. The first sample consisted of 215 participants, 167 females, 48 males, with a mean age of 19.0 years, while the second sample consisted of 126 participants, 86 females, 42 males, with a mean age of 20.3 years. Participants were asked to complete the Weight Concern Scale (Rozin et al., 2003), which contained 18 statements that reflected thoughts on weight concern. Participants responded to questions such as "I am currently on a diet" and "I am concerned about my weight", using different response formats. Participants were then instructed to take the Food Negativity Scale (Tapper & Pothos, 2010) which contained 11 items that reflected negative thoughts associated with eating. Participants responded to questions such as "I think I love food" and "I hate to be distracted by thoughts about food", using a 5-point Likert scale of measurement ranging from 1 (completely disagree) to 5 (completely agree). Participants were then instructed to the Link Between Diet and Health Questionnaire (Arauz et al., 2016) which contained a single question that examined thoughts on how well they believe diets work for their overall health. Participants responded to the question "How much of an effect do you think diet has on" which was applied to four different conditions: 1) heart disease; 2) good health; 3) obesity, and 4) cancer. Participants rated their responses using a 4-point Likert scale of measurement ranging from 1 (no effect) to 4 (strong effect). Participants were then instructed to complete The Depression Scale of the Center for Epidemiological Studies (CES-D, Radloff, 1977), which contained 20 items that reflect six dimensions of depression: 1. depressed mood, 2. feelings of guilt and worthlessness, 3. feelings of hopelessness and helplessness, 4. psychomotor retardation, 5. loss of appetite, and 6. sleep disorders. Participants rated items that measured the frequency of each dimension of depression, using a 4-point Likert scale of measurement ranging from 1 (rarely to never) to 4 (most of the time). Next, participants were then instructed to complete The State Anxiety Inventory (STAI, Barnes et al., 2002) which contained 20 items for assessing the symptoms of anxiety. Participants responded to questions such as "I feel nervous and restless," and "I feel that I lack

confidence in myself, using a 4-point Likert scale of measurement ranging from 1 (almost never) to 4 (almost always). Lastly, participants were asked to indicate their height and weight, and the researchers estimated their BMI's.

Results indicated that Euro-American participants were more concerned with weight and reported negative attitudes towards food, whereas Costa Rican participants were less concerned about weight and reported more positive attitudes towards food, although both believed that diet contributes to overall wellbeing. These results categorize the difference between individualistic and collectivist cultures. An individualistic culture places an emphasis on independence in that individuals in this culture believe that it is their responsibility to stay fit and eat healthy. If an individual overindulges it is seen as a sign of weakness. In addition, since this culture places an emphasis on ideal body types, individuals in this culture believe that obesity is caused by a lack of self-control (Arauz et al., 2016). In contrast, in a collectivist culture, people belong to a group and food is associated with social interactions. Individuals in this culture tend to have a positive attitude towards food because it is associated with these positive aspects.

### **Biological Issues**

In the United States, society's messages about body standards are deeply ingrained in our culture. As previously mentioned, individuals are criticized for not conforming to these standards (The National Health Service, 2020). Our society is quick to place judgment on others and forgets that there may be other reasons why individuals struggle with losing weight, in some cases weight gain is due to underlying health conditions. The National Health Service (2020) states nine reasons why individuals find it hard to lose weight: 1. underactive thyroid, 2. diabetes treatment, 3. ageing, 4. steroid treatment, 5. Cushing's syndrome, 6. stress and low mood, 7. tiredness, 8. fluid retention, and 9. Polycystic ovary syndrome. Underactive thyroid is a deficiency in which heart rate, body temperature, and metabolism are disrupted, the major symptoms of this deficiency include tiredness, sensitivity to cold, constipation, dry skin, and weight gain. Diabetes treatment is another factor that can contribute to why individuals struggle to lose weight, in order to manage diabetes, individuals must take insulin which causes an increase in weight gain. Ageing plays a major role in weight gain, as we age muscle is lost and fewer calories are burned, so if individuals eat the same number of calories and are less physically active, weight gain will occur. Steroid treatments are used to treat a variety of conditions, long term use of corticosteroids which are a class of steroid hormones that lowers inflammation in the body, causes an increase in appetite and can lead to weight gain. Cushing's Syndrome occurs when the body is exposed to high levels of the hormone cortisol for a long time, and when left untreated can lead to weight gain. Stress, anxiety and depressed mood also play a factor in why it is hard for individuals to feel motivated, as a coping mechanism some individuals turn to food which leads to further weight gain. It is still unclear why tiredness increases weight gain, but studies have

explored the theory that individuals who are sleep-deprived have reduced levels of leptin, the chemical that makes you feel full, and higher levels of ghrelin, the hunger-stimulating hormone, which makes individuals more susceptible to overeating (The National Health Service 2020). Unexplained weight gain may be also the result of fluid retention, swelling occurs in different locations of the body and depending on the severity can be a symptom of heart or kidney disease. Lastly, women with polycystic ovary syndrome (PCOS) have a hormonal imbalance and metabolism problems that may affect their health, and often gain weight or have a hard time losing weight.

In addition, researchers at the Phoenix Epidemiology and Clinical Research Branch examined how metabolic differences play a role in how individuals lose weight when following a restricted low-calorie diet. The researchers recruited 24 obese participants, 12 females and 12 males in the facility's metabolic unit. Participants were instructed to fast for a day, and the researchers used a whole-room indirect calorimeter which allows energy expenditure to be calculated based on air samples. They also took baseline measurements of the participant's energy expenditure. Next, participants were instructed to follow a six-week inpatient phase of 50 percent calorie reduction. Participant's age, sex, race, and baseline weight were also accounted for.

Results indicated that participants who lost weight during the calorie reduction diet were those whose metabolism decreased the most during fasting (National Institute of Diabetes and Digestive and Kidney Diseases, 2015). In addition, the researchers state that individuals either have a "thrifty" metabolism or a "spendthrift" metabolism, which play a factor in weight loss. A "thrifty" metabolism describes participants in the study who lost the most weight, and a "spendthrift" metabolism refers to participants whose metabolism decreased the least. These findings suggest that some obese individuals can face difficulty losing weight because of metabolic differences, but researchers state that a balanced diet and physical activity can be an effective tool for weight loss.

### **Economic Issues**

Apart from medical or biological reasons that make it difficult for individuals to lose weight, eating healthy costs more money, and many individuals cannot afford a healthy diet. Drewnowski and Eichelsdoerfer (2017) examined how low-income Americans struggle and face a barrier when it comes to the affordability of nutritional foods. Using a literature review process, the researchers focused on the rising cost of a healthy diet and examined the USDA-designed Thrifty Food Plan (Carlson et al., 2007) and the Supplemental Nutrition Assistance Program (SNAP, Freeman, 1964) both of which are designed to provide inexpensive healthy food options for individuals. The Thrifty Food Plan was implemented in June 2008 and is one of four USDA-designed food plans that specifies specific food types and necessary daily intake needed to provide an adequate amount of nutrition. The Thrifty Food Plan is used as a model to set the maximum amount of benefits designated for SNAP, which for a family of four is \$588.30 per month, or around \$20 per day. After the evaluating all

past research, the researchers stated that the Thrifty Food Plan disregards the eating patterns of the American populations, and that a shift needs to be directed towards providing a diet that balances good nutritional foods with a cost-effective price (Drewnowski & Eichelsdoerfer, 2017). The researchers concluded that affordable good nutrition requires careful consideration towards nutrient density and cost, and should reflect the current food patterns of everyday families.

### **Addressing the Issue**

Our society is always developing and even though society continues to impose culturally accepted norms of what makes someone beautiful, there has been more of an acceptance of embracing people of all sizes and shapes. Brah (2020) examined the body-positivity movement known as Normalize Normal Bodies, started by Mik Zazon (2020) with the intent to open up the conversation about body image, self-acceptance, and self-love geared towards men and women who struggle with body acceptance. This movement has become a popular trend on social media. The term of what is deemed to be a normal body is up for debate, but it means that everyone is different and there isn't one body that represents the standard of what is considered beautiful or normal. Over 21,000 women have used the hashtag Normalize Normal Bodies, including celebrities, which helps validate the main message behind this cause. This movement has helped address those norms set by society and has shifted the focus to educating people about the weight-based stigma that many individuals face. Having a movement like this is something that has had a positive effect on society, but more needs to be done in order to combat weight-based discrimination.

Weight-based discrimination is a struggle that many individuals are faced with and there needs to be more initiatives to help protect people. One solution on how to combat this is by having public health professionals create an intervention campaign or message about weight bias and size diversity. Sonnevile and Bauer (2018) addressed steps public health professionals should take in order to educate people about the misconceptions and generalizations of different body types. The first suggestion is stop showing pictures of individuals with larger bodies that are unflattering, these pictures feature unattractive angles of individuals performing sedentary activities. The proposed solution is representing individuals with larger bodies the same way thin individuals are represented, with flattering lighting and engaging in diverse activities. If everyone is portrayed in the same manner, this can aid in eliminating the assumptions and negative attitudes faced by individuals with larger bodies. The next proposed solution is to use different terminology when talking about a diverse group of body types, using terms that are acceptable for everyone. In some medical journals individuals with larger bodies are labeled as "person with obesity" (Puhl & Suh, 2015), with the term obesity being used to describe a disease. This in turn creates a stigma for individuals who fit into that category. By using the categories smaller bodies or larger bodies it does simplify the human body, but an individual should not be made to feel like they have a disease. Finally, the last proposed solution is that public health professionals need to

avoid making assumptions or generalizations about smaller bodies being healthy, and that healthiness is only obtained at a certain weight. People assume that if a person is skinny that they must automatically be healthy, but regardless of weight, an individual can have a poor diet and sedentary lifestyle. Public health professionals can combat this by focusing on enhancing an individual's health regardless of how much they weigh. By using the above suggestions public health professionals will educate people, eliminate the stereotypes about individuals with larger bodies, and create a weight-inclusive approach to health care.

## **The Present Study**

The purpose of the present study was to examine factors pertaining to weight stereotyping and the perception of intelligence, confidence, and the likelihood of relationship status. Participants were randomly assigned to either view images of individuals who were represented as a magazine model, or a regular everyday person. Participants were then asked to complete the Perceived Intelligence Scale, the Relationship Status Questionnaire, and the Perceived Confidence Scale. It was hypothesized that participants who viewed the images representative of magazine models will rate those individuals as more intelligent, more confident, and more likely to be in a relationship, as compared to those who viewed images representative of the regular everyday individuals.

## **Methods**

### *Participants*

A sample of 38 students (35 female, 2 males, and 1 other), were recruited through the CSU Stanislaus Department of Psychology online participant pool (SONA). The age of the participants ranged from 19 to 46. The sample was predominantly Hispanic/Latino (63%) followed by Caucasian/White (24%), Heterosexual (92%), and upperclassmen (63%). When participants were asked if they were currently in a relationship (68%) identified as being in a relationship and (32%) of participants identified as not being in a relationship. All participants were given 1 SONA credit for participating in the study, which may have counted as experimental credit for a psychology class.

### *Design*

The research design was a single factor, two-group, between-subjects design to examine factors pertaining to women's appearance and perception. The independent variable was the type of stimuli shown (images of male and female magazine models, or images of everyday males and females) Each participant was randomly assigned to one of the two experimental conditions and viewed the specific images designated for that condition. The dependent variables were perceived self-esteem, perceived relationship status, and perceived intelligence of the individuals in the image.

### *Measures and/or Materials*

The measures used in the study were a demographics questionnaire (see Appendix A), the Perceived Intelligence Scale (Ortega, 2020; see Appendix

B), a single question to assess the likelihood of a relationship status of the individual in the image (Ortega, 2020; see Appendix C), and the Perceived Confidence Scale (Ortega, 2020; see Appendix D). The demographics questionnaire consisted of 6 questions designed to assess the participants' personal characteristics, one of which asked participants if they were in a relationship. The Perceived Intelligence Scale was designed to assess the perceived intelligence of the individuals in the images, using a 4-point Likert-scale of measurement, with 1 being Least Likely, and 4 being Most Likely. The Relationship Status question was designed to assess the likelihood of the individual in the image to be in a relationship using a 4-point Likert scale of measurement with 1 being Not at All Likely and 4 being Extremely Likely. The Perceived Confidence Scale was designed to assess the perceived confidence of the individual in the image using a 4-point Likert scale of measurement with 1 being Not at all confident and 4 being Very confident. The materials used in the study included 16 images, 4 males who were represented as magazine models, 4 females who were represented as magazine models, 4 males who were represented as everyday individuals, and 4 females who were represented as everyday individuals (see Appendix E).

## **Procedure**

Participants were recruited through SONA. Those who were interested were able to access further information about the study, the Consent Form (see Appendix F) questionnaires, images, and scales through Qualtrics. Once a participant agreed to participate, they were instructed on how to advance through all portions of each section, beginning with the Consent Form.

Upon completion of the Consent form, the participants were then instructed to complete a demographics questionnaire. Participants were then randomly assigned to one of the two conditions and informed that a series of images would be presented to them on a computer screen. Participants in the magazine model condition viewed images of individuals who were dressed fashionably and portrayed in modeling scenarios, whereas those in the everyday individual condition viewed images of the same individuals but who were portrayed in everyday, average situations.

At the end of the presentation of each image participants were directed to complete The Perceived Intelligence Scale, the Relationship Status Questionnaire, and the Perceived Confidence Scale at which time they were asked to rate each individual in each image on these variables of interest.

At the conclusion of the experiment, the participants were directed to the debriefing sheet (see Appendix G), at which time they were thanked for their participation, and the purpose of the study was explained to them. It was clarified to them that the study's purpose was to examine factors pertaining to weight stereotyping and the perception of intelligence, confidence, and the likelihood of relationship status.

## **Results**

To determine whether there were differences in factors pertaining to weight stereotyping and the perception

of intelligence, confidence, and the likelihood of relationship status, data were analyzed using an independent samples *t* – test. The researcher hypotheses were not supported. No significant differences were found between the groups relative to intelligence, likelihood of being in a relationship, and confidence,  $t(35) = 0.76$ ,  $p = .454$ ,  $d = .19$ ,  $t(35) = 0.68$ ,  $p = .506$ ,  $d = .17$ ,  $t(35) = 1.54$ ,  $p = .132$ ,  $d = .59$ , respectively. Although not significant, participants in the magazine model condition reported somewhat higher levels of perceived intelligence ( $n = 18$ ,  $M = 2.6$ ,  $SD = 0.57$ ), the likelihood of being in a relationship ( $n = 18$ ,  $M = 3.7$ ,  $SD = 0.71$ ), and confidence ( $n = 18$ ,  $M = 4.1$ ,  $SD = 0.57$ ) as compared to those in the everyday individual condition ( $n = 19$ ,  $M = 2.5$ ,  $SD = 0.43$ ), ( $n = 19$ ,  $M = 3.6$ ,  $SD = 0.39$ ), ( $n = 19$ ,  $M = 3.8$ ,  $SD = 0.42$ ), respectively (see Table 1).

**Table 1**  
Descriptive Statistics of Perceived Intelligence, Likelihood of Relationship, and Perceived Confidence as a Function of Type of Image

| Type of Image              | Magazine Models |           | Everyday Individuals |           |
|----------------------------|-----------------|-----------|----------------------|-----------|
|                            | <i>M</i>        | <i>SD</i> | <i>M</i>             | <i>SD</i> |
| Perceived Intelligence     | 2.6             | 0.57      | 2.5                  | 0.43      |
| Likelihood of Relationship | 3.7             | 0.71      | 3.6                  | 0.39      |
| Perceived Confidence       | 4.1             | 0.57      | 3.8                  | 0.42      |

Note.  $n = 18$  for Magazine Models,  $n = 19$  Everyday Individuals.

## Discussion

The results of the present study did not support the hypothesis that participants who view the images representative of magazine models will rate those individuals as more intelligent, more confident, and more likely to be in a relationship, as compared to those who view images representative of the regular everyday individuals. These results are not consistent with previous studies (Blake, 2020; Bleske-Rechek et al., 2014; Cossrow et al., 2001; Harris et al., 1990; Swami et al., 2008). Previous research indicated that individuals who did not fit into societal standards would be perceived negatively and treated differently by others. However, participants in the present study rated magazine models slightly higher on the scales than the everyday individuals.

These results have important implications relative to weight stereotyping and the perception of intelligence, confidence, and the likelihood of relationship status. Although the results were not significant, participants still perceived the magazine models to be intelligent, in a relationship, and confident. These findings suggest that our society has a preference for individuals who fit into society's standard of beauty and perceive them as higher status.

The current study faced multiple limitations. Due to the COVID-19 pandemic all classes are currently being taught through virtual instruction, and this has caused complications for students. Some students may have issues connecting to the internet or dealing with stress related to the pandemic. The sample for this study consisted of CSU Stanislaus Psychology students, which caused a limited number of participants. Overall, this study will be significant in future research and gives researchers new ideas on how to conduct studies on weight-based

discrimination between genders. Further work is needed to help find a possible solution to help combat the ideology set by individualist cultures and how to educate more people on weight-based stereotyping.

## Acknowledgements

I would like to thank the California State University, Stanislaus Honors Program for providing support throughout this research, as well as Professor Forester for being my faculty mentor and guiding me throughout the duration of this project

## References

- [1] Blake, M. (2020, May 8). *Read this if you don't understand why complimenting Adele's weight loss is toxic.* She Knows. <https://www.sheknows/health-and-wellness/articles/2231279/adele-weight-loss-body-shame-fatphobia/>
- [2] Barnes, L. L., Harp, D., & Jung, W. S. (2002). Reliability generalization of scores on the Spielberger State-Trait Anxiety Inventory. *Educational and Psychological Measurement*, 62(4), 603-618. doi:10.1177/0013164402062004005
- [3] Bleske-Rechek, A., Kolb, C., Stern, A., Quigley, K., & Nelson, L. (2014). Face and body: Independent predictors of women's attractiveness. *Archives of Sexual Behavior*, 43(7), 1355-1365. doi:10.1007/s10508-014-0304-4
- [4] Brar, S. L (2020, February 10). *The #normalizenormalbodies movement is going viral for all the right reasons.* Shape Lifestyle. <https://www.shape.com/lifestyle/mind-and-body/normalize-normal-bodies-instagram-movement>
- [5] Cossrow, N. H., Jeffery, R. W., & McGuire, M. T. (2001). Understanding weight stigmatization: A focus group study *Journal of Nutrition Education*, 33(4), 208-214. <https://pubmed.ncbi.nlm.nih.gov>
- [6] Drewnowski, A., & Eichelsdoerfer, P. (2009). Can low-income Americans afford a healthy diet? *Nutrition Today*, 44(6), 246- 249. doi:10.1097/nt.0b013e3181c29f79
- [7] Fooyoh Entertainment Network (n.d.). *Artists took 20 plus size models and made them thin with photoshop* [http://m.fooyoh.com/iamchiq\\_living\\_lifestyle/14939268](http://m.fooyoh.com/iamchiq_living_lifestyle/14939268)
- [8] Harris, M. B., Waschull, S., & Walters, L. (1990). Feeling fat: Motivations, knowledge, and attitudes of overweight women and men. *Psychological Reports*, 67(8), 1191-1202. doi:10.2466/pr0.1990.67.3f.1191

- [9] National Health Service (2020). *9 medical reasons for putting on weight*. <https://www.nhs.uk/live-well/healthy-weight/nine-medical-reasons-for-putting-on-weight/>
- [10] National Institute of Diabetes and Digestive and Kidney Diseases. (2015). *Ease of weight loss influenced by individual biology*. National Institute of Health. <https://www.nih.gov/news-events/news-releases/ease-weight-loss-influenced-individual-biology>
- [11] Rodríguez-Arauz, G., Ramírez-Esparza, N., & Smith-Castro, V. (2016). Food attitudes and well-being: The role of culture. *Appetite*, *105*, 180–188. [10.1016/j.appet.2016.05.019](https://doi.org/10.1016/j.appet.2016.05.019)
- [12] Radloff, L. S. (1977). The CES-D Scale. *Applied Psychological Measurement*, *1*(3), 385–401. [doi:10.1177/014662167700100306](https://doi.org/10.1177/014662167700100306)
- [13] Puhl, R., & Suh, Y. (2015). Health consequences of weight stigma: Implications for obesity prevention and treatment. *Current Obesity Reports*, *4*(2), 182–190. [doi:10.1007/s13679-015-0153-z](https://doi.org/10.1007/s13679-015-0153-z)
- [14] Rozin, P., Bauer, R., & Catanese, D. (2003). Food and life, pleasure and worry, among American college students: Gender differences and regional similarities. *Journal of Personality and Social Psychology*, *85*(1), 132–141. [doi:10.1037/0022-3514.85.1.132](https://doi.org/10.1037/0022-3514.85.1.132)
- [15] Sonnevile, K., & Bauer, K. (2018, October 11). *3 ways public health professionals can combat weight stigma*. The Pursuit University of Michigan School of Public Health <https://sph.umich.edu/pursuit/2018posts/3-ways-public-health-professionals-can-combat-weight-stigma.html>
- [16] Swami, V., Furnham, A., Amin, R., Chaudhri, J., Joshi, K., Jundi, S., Miller, R., Mirza-Begum, J., Begum, F. N., Sheth, P., & Tovée, M. J. (2008). Lonelier, lazier, and teased: The stigmatizing effect of body size. *Journal of Social Psychology*, *148*(5), 577–594 [doi:10.3200/SOCP.148.5.577-594](https://doi.org/10.3200/SOCP.148.5.577-594)
- [17] Tapper, K., & Pothos, E. M. (2010). Development and validation of a Food preoccupation questionnaire. *Eating Behaviors*, *11*(1), 45–53. [doi:10.1016/j.eatbeh.2009.09.003](https://doi.org/10.1016/j.eatbeh.2009.09.003)
- [18] Wilkinson, E. (2014, July 27). Guys have image problems too. Truth love confidence. <https://truthloveconfidence.weebly.com/blog/guys-have-image-problems-too>

## Appendix A

### Demographics Questionnaire

- 1) Which gender do you identify with?  
 Male  Female  Other \_\_\_\_\_
- 2) What is your age? \_\_\_\_\_
- 3) What year in college are you?
  - a.  Freshman
  - b.  Sophomore
  - c.  Junior
  - d.  Senior
- 4) Which of the following best describes your ethnicity?
  - a.  Caucasian (White/Non-Hispanic)
  - b.  Black/African American
  - c.  Hispanic/Latino
  - d.  Asian American
  - e.  American Indian/Alaska Native
  - f.  Native Hawaiian/Pacific Islander
  - g.  Other \_\_\_\_\_
- 5) What is your sexual orientation?
  - a.  Heterosexual
  - b.  Gay
  - c.  Lesbian
  - d.  Bisexual
  - e.  Pansexual
  - f.  Other \_\_\_\_\_
- 6) Are you currently in a relationship
  - a)  Yes
  - b)  No

## Appendix B

### Perceived Intelligence Scale

Instructions: Please respond to the following question

| Least Likely | Unlikely | Likely | Mostly Likely |
|--------------|----------|--------|---------------|
| 1            | 2        | 3      | 4             |

1) How intelligent does the individual in the image appear? \_\_\_\_\_

## Appendix C

### Relationship Status Scale

Instructions: Please respond to the following question

| Not at All Likely | Unlikely | Likely | Extremely Likely |
|-------------------|----------|--------|------------------|
| 1                 | 2        | 3      | 4                |

1) How would you rate the likelihood of this individual being in a relationship? \_\_\_\_\_

## Appendix D

### Perceived Confidence Scale

Instructions: Using the accompanying scale, please answer the following question

| Not at all confident | Not confident | Neutral | confident |
|----------------------|---------------|---------|-----------|
| 1                    | 2             | 3       | 4         |

**Very confident**

5

1) How confident would you say this individual is?

\_\_\_\_\_



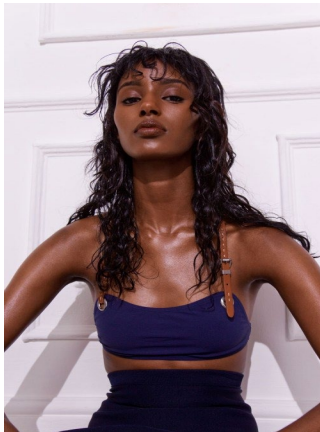
**Appendix E**

**Materials**

**Condition A:** magazine models

4 Images of females

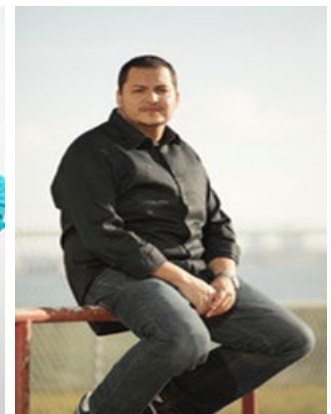
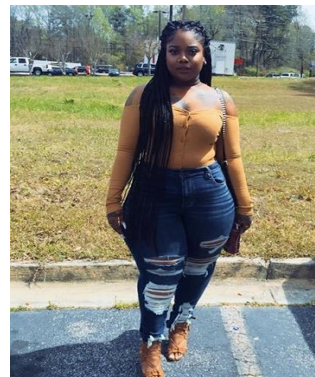
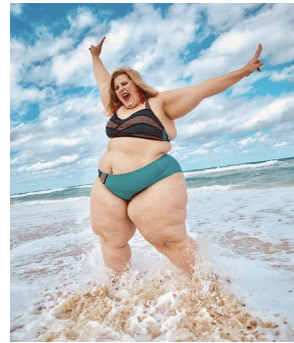
4 Images of males



**Condition B:** everyday individuals

4 Images of females

4 Images of males





## Appendix F

### Consent Form

1. **Summary:** This research study will examine the factors that are related to the media's impact on body image perception. If you agree to participate, you will be asked to view images and answer questions that are personal in nature that may cause you to experience a minimal amount of discomfort.
2. **Your right to withdraw/discontinue:** You are free to discontinue your participation at any time without penalty. You may also skip any survey questions that make you feel uncomfortable. Even if you withdraw from the study, you will receive any entitlements that have been promised to you in exchange for your participation, such as one (1) experimental credit in SONA.
3. **Benefits:** Participation in this research study does not guarantee any benefits to you. However, possible benefits include the fact that you may learn something about how research studies are conducted and you may learn something about this area of research (body image stereotypes and perception). You will receive one (1) experimental credit which may count as extra credit for a psychology class. There is no anticipated commercial profit related to this research.
4. **Additional information:** You will be given additional information about the study after your participation is complete.
5. **Costs:** If you agree to participate in the study, it may take up to 20 minutes to complete the survey. There are no costs to you beyond the time and effort required to complete the procedures listed above.
6. **Guarantee of Confidentiality:** All data from this study will be kept from inappropriate disclosure and will be accessible only to the researcher and their faculty advisor. Data collected online will be stored on a password-protected website and de-identified for analyses. The researcher **will not** keep your research data to use for future research or other purposes. The researcher is not interested in anyone's individual responses, only the average responses of everyone in the study.
7. **Risks:** The present research is designed to reduce the possibility of any negative experiences as a result of participation. Risks to participants are kept to a minimum. However, if your participation in this study causes you any concerns, anxiety, or distress, please contact the Student Counseling Center at (209) 667-3381 to make an appointment to discuss your concerns.
8. **Researcher Contact Information:** This research study is being conducted by Tawny Ortega. The faculty supervisor is Deborah Forester, M.A., Lecturer, Department of Psychology and Child Development, California State University, Stanislaus. If you have questions or concerns about your participation in this study, you may contact the researchers through Ms. Forester at [dforester@csustan.edu](mailto:dforester@csustan.edu).
9. **Results of the Study:** You may obtain information about the outcome of the study at the end of the academic year by contacting Ms. Forester. You may also learn more about the results of the study by attending the Psychology Department's Undergraduate Research Symposium at the end of the semester.
10. **Psychology Institutional Review Board Contact Information:** If you have any questions about your rights as a research participant, you may contact the Chair of the Psychology Institutional Review Board of California State University Stanislaus at [psychologyIRB@csustan.edu](mailto:psychologyIRB@csustan.edu).

11. **Personal Copy of Consent Form:** You may print a blank, unsigned copy of this consent form now.
  
12. **Verification of Adult Age:** By clicking “I Agree” below, you attest that you are 18 years old or older.
  
13. **Verification of Informed Consent:** By clicking “I Agree” below, you are indicating that you have read and understand the information above, that all of your questions have been answered to your satisfaction, and that you freely consent to participate in this research study.

- I agree
- I do not agree

## **Appendix E**

### **Debriefing Form**

Thank you for participating in this study! I am interested in understanding factors pertaining to weight stereotyping and the perception of intelligence, confidence, and the likelihood of relationship status. Prior research suggests that that many adults face weight-based stigmatization and experience mistreatment. These forms of mistreatment include teasing, harassment, slurs, insults, negative judgment and assumptions, and perceived discrimination. This mistreatment is seen in every aspect of their lives. I expect to find similar results in my study.

All the information I collected in this study will be kept safe from inappropriate disclosure, and there will be no way of identifying your responses in the data archive. I am not interested in anyone’s individual responses; rather, I want to look at the general patterns that emerge when all of the participants’ responses are put together. I ask that you do not discuss the nature of the study with others who may later participate in it, as this could affect the validity of our research conclusions.

If you have any questions about the study or would like to learn about the results of the study, you may contact Tawny Ortega through her research supervisor, Deborah Forester, M.A., at [dforester@csustan.edu](mailto:dforester@csustan.edu). You may also learn more about the results of the study by attending the Honors Capstone info at the end of the semester. If you have questions about your rights as a research participant, you may contact the Chair of the Psychology Institutional Review Board of California State University Stanislaus at [psychologyIRB@csustan.edu](mailto:psychologyIRB@csustan.edu). If participation in the study caused you any concern, anxiety, or distress, you may contact the Student

Counseling Center at (209) 667-3381.

If you would like to learn more about this research topic, I suggest the following references:

- Cossrow, N. H. F., Jeffery, R. W., & McGuire, M. T. (2001). Understanding weight stigmatization: a focus group study. *Journal of Nutrition Education, 33*(4), 208–214.  
[https://doi.org/10.1016/s1499-4046\(06\)60033-x](https://doi.org/10.1016/s1499-4046(06)60033-x)
- Swami, V., Furnham, A., Amin, R., Chaudhri, J., Joshi, K., Jundi, S., Miller, R., Mirza-Begum, J., Begum, F. N., Sheth, P., & Tovée, M. J. (2008). Lonelier, lazier, and teased: The stigmatizing effect of body size. *The Journal of Social Psychology, 148*(5), 577–594.  
<https://doi.org/10.3200/socp.1485.57>

# The Impact of Companion Animals on the Development and Health of Children

Lauren Zina Piro

*B.S. Candidate, Department of Business Administration, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

*Received 05 May 2021; accepted 20 July 2021*

---

## Abstract

Starting in the late 1960s, professional studies began on the interaction between children and pets. Boris Levinson is credited with starting real research on this area of study. His case studies showed that pets can aid in the development of children. This paper will go in depth about the impact companion animals have on the social, emotional, and cognitive growth of children based on extensive review of peer-reviewed articles and journals. In addition, this paper will discuss whether or not pets are an advantage for children and their health. Background for this topic is sparse as human-animal interaction (HAI) is a fairly new field of study that comes with research difficulty, but research and results from fields similar to it are often used as a starting point for researchers.

*Key Terms: companion animals, pets, human-animal interaction, child development, animal-assisted intervention*

---

## Introduction

The relationship between humans and their companion animals has existed since the beginning of humanity; shepherds relied on their dogs to keep their sheep safe and herded, while the ancient Egyptians worshipped their cats for protecting them from mice and famine. Companion animals make certain tasks much easier for humankind, but are they anything more than that? Should they be around children? An apparent response would be that yes, pets provide a child camaraderie, entertain them, and teach them responsibility. However, the positive impact is even more substantial than we might think.

Studies researching the impact of pets on children are showing pets have an even greater positive influence on kids than was previously believed. Amongst the above mentioned, research is showing that companion animals--mainly dogs and cats--assist in socio-emotional and cognitive development, as well as have a positive impact on a child's health. These are all aspects that follow the child into adulthood.

This field of study is important and relevant because the way a child develops is a crucial part of *the rest of their lives*. Development in those early years determines what kind of person a child will become in adulthood and how they'll exist amongst their society. Not only does child development have an impact on a personal level, it also affects society as a whole. Bettering the children of our society leads to an advancement of cognitive, emotional, and social

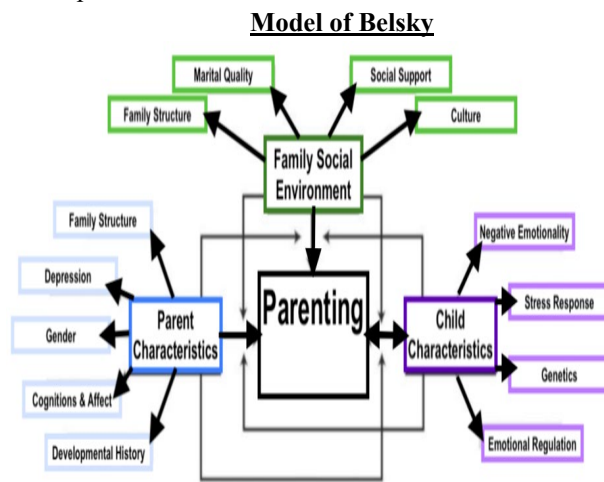
skills in teenagers and adults. The more positive influences a child has, the more-equipped that new generation will be; thus, the better society will be. Research in this field will also determine if children (and adults) with physical and mental conditions cope with more ease with animal companions than without them. More and more research is proving that companion animals have a positive impact on child development, so having further studies and results in this field should be something of importance to everyone.

Being that this is a fairly new research area, studies and cases from other fields are compiled in understanding this topic and the lasting positive impact pets have on children. Past research on the benefits of therapy animals on adults and seniors is used when trying to understand the impact on a child's mental, emotional, and social growth.

## Literature Review

When measuring how children develop, researchers take advantage of a couple of different methods and models. The most widely accepted model is the Model of Belsky (Endinburg, & Van Lith, 2011). According to Belsky, children must master certain social, emotional, and cognitive tasks in order to continue to develop. The following are the three major influencers of this development: characteristics of the child as an individual,

psychological resources of the child's parents, and contextual sources of stress and support that the child may receive. Most researchers looking at the impact of pets on children refer to the Model of Belsky for their studies because, unlike the other models used in child development, it takes into account different aspects of a child's life that affect their growth (Endenburg, & Van Lith, 2011). Even so, other influencers not mentioned in Belsky's model, such as trauma, also play a major role in how a child develops.



Psychologists agree that children have a natural curiosity and attraction to animals, and therefore recognize them as a resourceful learning tool. This is one of the main reasons why some classrooms have classroom pets for children to interact with. In addition, it is known in child psychology that children learn and retain more when they are emotionally invested in a topic and associate meaningful relationships with a topic (Melson, 2003). Having a companion animal as an “incentive” for learning has shown to improve learning in small children for this reason.

In addition, there is a note of caution that the child needs to have a safe relationship with their companion animal. It is up to the adult to make sure that the pet is appropriate for that *specific* child. The child *and* animal must be taught how to interact without being of danger to each other. This is a crucial aspect in order to retain the benefits of the pet on the development of the child (Melson, 2003).

One of the main impacts is the actual bond between the child and their companion animals. Just

being exposed to a companion animal doesn't have long-term impacts on development. There needs to be an actual *relationship* between the two. The creation of this bond forms, what most children describe, a “special friendship” between child and animal. In a study on sixth grade children, the children rated their pets “under parents but before other friends and family” in relation to how important their bond is to them (Mani, & Weese, 2016).

Another impact of this field of study is the *type* of animal that is associating with the child. For instance, a pet frog will not have the same effects on cognitive development as a dog might have. Studies have looked at various farm animals, reptiles, birds, cats, and dogs and have found dogs (then, cats) to have the most impact on positive child development (Mani, & Weese, 2016). Dogs, being more domesticated, are able to interact with children in a safe manner. Dogs have a natural tendency to be loyal to their owner, and children have a tendency to form relationships with people and animals who show them kindness. With companion animals --dogs and cats, mostly-- children “display classic attachment behaviors, including: seeking close physical contact, protesting separation/striving to be reunited, communicating through touch and nonverbal cues, and turning to one another for comfort” (Melson, 2003).

### Socio-Emotional Impact

Companion animals have an impact on the social impact on children. Having a household with animals has been shown to help children be more socially competent as adults than those children not exposed to companion animals. There is a direct positive relationship involving pets and empathic skills in children. These abilities include improved capability of handling social situations such as networking and having authentic relationships with other humans (Mani, & Weese, 2016).

Being exposed to pets has shown to help development and improve the social intelligence in a child. Psychologists have come to the conclusion that children who empathize with animals learn to apply that empathy to their relationship with humans; empathetic traits like knowing another's needs, feelings pain and relation to others, and coping with emotions can be formed in a child's relationship with their pets (Monsen, 2001).

One of the most crucial and unique experiences between a child and their pet is the caregiving aspect. A child learns skills associated with parenting early on in life when caring for their pet. They learn that their pet needs to be fed, bathed, cared for, loved, and exercised. This in itself is a major factor in forming that bond between the two, because the companion animal learns to rely, care for, and be protective over their little human. Caring for their animal over the course of its life often helps develop long term empathy that a child will have for the rest of their life, making them more well-suited adults (Monsen, 2001).

Children find emotional safety in their pets, if they have an established bond. Dogs, in particular, are “appreciated for their loyalty, responsiveness to human beings, and ways of showing affection” (Jalongo, 2015). This is important because children are looking for that positive reaction to their own emotions. This interaction is even more valuable if the child is having a hard time interacting and sharing with parents, siblings, friends, or is an only child (Jalongo, 2015).

These important skills learned with and through animal companionship help raise children's self-esteem and confidence in the long run. The bond between companion animals and children can increase the amount of eye contact a child makes, counteracts aggression while decreasing depression, improves face memory and trust, and increases generosity and positive self-esteem (Beetz, Uvnäs-Moberg, Julius, & Kotrschal, 2012). In a recent study with pet-owning third, fourth, fifth, and sixth graders, these children “scored significantly higher in self-esteem than non-pet owners” (Van Houtte, & Jarvis, 1995).

### **Cognitive Impact**

Children are constantly learning about the world around them, and animals being “predictably unpredictable” keep children wondering and analyzing what the animal’s next move might be. The guessing aspect of this forces a child to stimulate verbal and non-verbal learning. This is an invaluable lesson when looking at child development because it impacts different aspects of learning (Beetz, Uvnäs-Moberg, Julius, & Kotrschal, 2012).

The simple fact that animals look different from humans sparks curiosity and interest in young

children. They are interested in how the animal “works” and what they will do next, which helps sustain their focus. The animal is also interested in the young child, as they too are curious about how the child “works” and what *they* will do next. This interaction is usually the beginning of forming the bond between child and pet, as they learn to rely on each other and others (like parents) for survival (Burr, 2016).

As previously mentioned, pets can act as a motivation to learn. Pets have been used to increase concentration span and capability in a child. For instance, children find it more enjoyable to read out loud to their companion animal or classroom pet than to read alone or in their head (Burr, 2016). Over time, this can lead to more capacity for understanding and retaining knowledge, improved social skills, and better understanding of worldly concepts in a child.

Studies from 2007 have shown that the “preconditions for learning are positively impacted by animals” (Burr, 2016). Looking at a group of developmentally delayed and a group of normally developed children, both groups performed with the same accuracy for motor skill tasks when a dog was present versus when a dog was not present. The researchers explain that the dog served as an “effective motivator and decreased the children’s anxiety and stress during performing of the task, therefore increasing the speed of performance” (Beetz, Uvnäs-Moberg, Julius, & Kotrschal, 2012). Another study with young children showed that fewer prompts for memory tasks were needed in the presence of a dog versus the presence of another human. Studies like this indicate that pets indirectly benefit the child by reducing stressors and improving relaxation, creating a more comfortable environment for learning for children.

These positive outcomes are especially beneficial with children with autism. Animal-assisted intervention (AAI) is becoming more and more popular because of how well it works with children with autism as well as children with attention-deficit hyperactivity disorder, and other conditions. In addition, AAI is beneficial for children in a medical setting. Forming a connection and being in the company of companion animals is an alternative, and sometimes full solution, in helping these children live. Instead of being on heavy medication, children

can learn to cope in a more natural and beneficial way (Dobbs, 2006).

### **Improvement of Health**

In a reality where about twenty-five percent of children and teenagers in the United States have a chronic health condition, a valuable segment of study in this field is the impact of companion animals on a child's general health. Companion animals improve medical adherence in addition to arrays of positive impact on the psychophysiological aspect in humans (Gupta, Wiebe, Pyatak, & Beck, 2018).

One struggle children with medical conditions have is remembering to take their medication or perform certain medical tasks. Companion animals can with this by "embedding a medical regiment within the pet care routine, a semi-automatic response is created" (Gupta, Wiebe, Pyatak, & Beck, 2018). This performance creates a habit that if one is completed, the other must be done as well. remind a child to take their medication or perform a certain medical task.

A big part of animal assisted intervention are therapy animals, specifically dogs. Not only do therapy animals assist children on the emotional and psychological aspect, they are also an aide for various physical disabilities. Because of their natural tendencies, dogs are the animals that are usually trained to be service animals for children (and adults) with physical disabilities. For example, service dogs can help lead a blind child, retrieve objects for children with mobility challenges, and alert children and parents to the possible onset of diabetic emergencies or epileptic seizures (Dobbs, 2006).

A subset of animal assisted intervention (AAI) is animal assisted therapy (AAT). AAT is used as a part of physical therapy. Children are asked to walk a dog, brush a cat, or play catch as part of their therapy. These types of physical activities help improve muscle tone and strength, and increase motor skills overall. The animal makes the therapy more mentally bearable for the child. In addition, the animal acts as a positive reinforcement for the child. The dog enjoys being walked and played with, just like the cat likes being groomed (Dobbs, 2006). The child feels important and wants to help the animal feel good, just as much as the animal wants to interact with the child. AAT is proven to be effective for young children because the animals have a natural

tendency to bond with humans. They can "promote a warm and safe atmosphere that can be independently therapeutic and help clients accept interventions offered by the treatment provider". Although AAT is not viewed as a stand-alone medical treatment, they are seen as a helpful supplement (Endenburg, & Van Lith, 2011).

Dogs are also used by various health-care professionals as part of neurological rehabilitation programs, especially for children who have been victims of sexual and physical abuse. Their companionship, dependency, and loyalty retrain the child how to trust and rely again (Jalongo, 2015).

All of this adds build up and helps children with medical conditions lead a normal life. Most importantly, they help the child *feel* normal and more like the "regular kids". The children don't have to rely on their caretakers for everything and can be more independent. In addition, the presence of an animal excites children, which can help the pets owner start conversations and ultimately make friends with their classmates, if that is something they struggle with (Endenburg, & Van Lith, 2011).

### **Methods**

This research paper is a compilation of numerous peer-reviewed articles and journals. Gail F. Melson, Susan Peet, and Cheryl Spark's article titled "Children's Attachment to their Pets: Links to Socio-Emotional Development" published in 1991 is one of the first staple studies that future researchers rely and look back at. Their study examines children's attachment to their pets in relation to different dimensions (like behavioral, cognitive, and empathy). The researchers conducted individual interviews with 120 children ranging from kindergarten, second, and fifth grade. In addition, the researchers developed a questionnaire for one parent of each child that they interviewed. After this study was published, other researchers in this field followed this article as an example. For instance, Beth Van Houtte and Patricia Jarvis, in 1995, developed their own questionnaire and gave it to 130 children ranging from third through sixth grade. Their research compared the autonomy, self-concept, and self-esteem of children who owned pets versus those who didn't. They published their findings in their article titled "The role of pets in preadolescent psychosocial development" (Van Houtte, & Jarvis, 1995). After



extensive review of already-there research, this paper brings together the conclusions, concerns, differences, and limitations that top researchers in this field have experienced and come across.

Peer-reviewed articles and journals are the main sources relied on and used to answer the research question. Like it is mentioned in the “Methods” section, Gail F. Melson, Susan Peet, and Cheryl Spark’s article titled “Children’s Attachment to their Pets: Links to Socio-Emotional Development” is one of the first studies that paved the way for future research in this field (Melson, Peet, & Spark, 1991). Their methods and impact are relevant and clear in other researchers’ works. Other types of articles that were taken advantage of are compilation articles. These articles reviewed multiple journals and articles to conclude that companion animals have a positive impact on children. One such article is a 2015 article titled “An attachment perspective on the child-dog bond: Interdisciplinary and international research findings” (Jalongo, 2015). Another type of article that was looked at were the articles that discussed the need for more research in the area, taking R.L. Servson’s 2014 article titled “The value of (research on) animals in children’s lives” for example (Servson, 2014). These articles were important to include because they show that this field has promising results and deserves more recognition. Valuable research and experiments for this topic takes years to complete, so completed experiments were used to back up the hypothesis.

## Results

Being a relatively new area of study, there aren’t as many concrete conclusions as there are positive implications that companion animals have a positive impact on children. Another reason for lack of conclusions are the many limitations associated with this field of study. In every article and peer-reviewed journal examined this research subject, not a single one showed negative consequences as a result of having companion animals around children. It is expected that future studies in this field show the same positive implications: companion animals have a positive effect on children’s cognitive, emotional, and physical health.

## Discussion & Limitations

There is no doubt that companion animals have a positive effect on children in the cognitive, emotional, and physical health aspects. However, this

subject is extremely sensitive, and there are numerous limitations in regards to how research is conducted and understood across different fields of psychology.

A main limitation is in the methodologies of the field itself. Psychologists are divided between two different methodologies: anthropocentrism and biocentrism. Some psychologists believe that humans are born being anthropocentric, believing that humans are the only living beings that have importance. Other psychologists believe that humans are born biocentric, believing that every living being has value and meaning. Studies on this field heavily depend and differ based on the researcher’s personal views.

Prior methods for this study (and those studies including adults and animals) include observations, surveys, and a few others. However, it is difficult and unethical to perform most experiments for this field of study making most methods of discovery not practical.

Another limitation is that different bodies of scientific fields are studying this topic in their own way without coming together. Because of this, the findings are “spread out over a number of journals and fields, constraining an integrative view” (Betz, Uvnäs-Moberg, Julius, & Kotrschal, 2012).

Research difficulties include the immeasurable qualities of humans and pets. For instance, how much empathy an individual possesses is different and unique for each and every person. There is no way to measure how much empathy a child who grew up with pets would have if they didn’t grow up with pets, and vice versa. In addition, some children are forced a companion animal while others who want one are not allowed one. Studies do not take into account the “forced” aspect of children with pets when looking at the benefits of their bond (Betz, Uvnäs-Moberg, Julius, & Kotrschal, 2012).

## Conclusion

Humans and animals have coexisted for centuries. Our companion animals are important parts of our culture, lives, art, books, and other aspects. They also have an important part in the development of children. Years of research have shown that children with pets have a better social, cognitive, and emotional development than children without pets. This area of study has some research difficulties.

However, there is consistent, promising evidence that companion animals have a positive impact on social, emotional, and cognitive development in a child. In addition, pets assist in improving the overall health of children with medical conditions. Future work in this topic is needed to establish more concrete conclusions of the positive influence companion animals have with the development of children.

### Acknowledgements

I'd like to thank the California State University, Stanislaus Honors Program for challenging me to complete this research. Thank you to Dr. Ellen Bell for guiding and supporting me from the beginning of this project. Thank you to Professor Suditi Gupta for helping me refine and tune this research towards the end. Lastly, I'd like to thank my mother, Dr. Helen Piro, for inspiring me to research a topic that betters the children of our society.

### References

- [1] Beetz, A., Uvnäs-Moberg K., Julius, H., & Kotrschal, K. (2012). Psychosocial and psychophysiological effects of human-animal interactions: the possible role of oxytocin. *Frontiers in Psychology*, 3(234), 1-15.
- [2] Burr, Amanda. (2016). Supporting children's social and emotional development through pets in the ECE context. 16 October 2016.
- [3] Dobbs, P. (2006). *The golden bridge: A guide to assistance dogs for children challenged by autism or other developmental disabilities*. West Lafayette, IN: Purdue University Press.
- [4] Endenburg, and Van Lith. "The Influence of Animals on the Development of Children." *The Veterinary Journal* 190.2 (2011): 208-14. Web.
- [5] Gupta, Olga T, Deborah J Wiebe, Elizabeth A Pyatak, and Alan M Beck. "Improving Medication Adherence in the Pediatric Population Using Integrated Care of Companion Animals." *Patient Education and Counseling* 101.10 (2018): 1876-878. Web.
- [6] Jalongo, M. R. (2015). An attachment perspective on the child-dog bond: Interdisciplinary and international research findings. *Early Childhood Education Journal*, 43(5), 395-405. doi: <http://dx.doi.org.ezproxy.ccclib.nocccd.edu/10.1007/s10643-015-0687-4>
- [7] Mani, I., & Weese, J. (2016). Pet Therapy: Enhancing Patient Care Through Time with Animals. *American Family Physician*, 94(9), 737-740.
- [8] McBride, A. (2014). Dogs and children: Match made in heaven or hell? *Veterinary Nursing Journal*, 29(10), 329-331.
- [9] Melson, Gail F. "Child Development and the Human-Companion Animal Bond." *American Behavioral Scientist* 47.1 (2003): 31-39. Web.
- [10] Melson, G., Peet, S., & Sparks, C. (1991). Children's Attachment to Their Pets: Links to Socio-Emotional Development. *Children's Environments Quarterly*, 8(2), 55-65. Retrieved from <http://www.jstor.org/stable/41514782>
- [11] Monsen, R. (2001). Children and pets. *Journal of Pediatric Nursing*, 16(3), 197-198.
- [12] New Environmental Research and Public Health Data Have Been Reported by Researchers at University of Liverpool (Companion Animals and Child/Adolescent Development: A Systematic Review of the Evidence). (2017). *Health & Medicine Week*, 4477.
- [13] Peacock, J., Chur-Hansen, A., & Winefield, H. (2012). Mental health implications of human attachment to companion animals. *Journal of Clinical Psychology*, 68(3), 292-303.
- [14] Purewal, R., Christley, R., Kordas, K., Joinson, C., Meints, K., Gee, N., & Westgarth, C. (2017). Companion Animals and Child/Adolescent Development: A Systematic Review of the Evidence. *International Journal of Environmental Research and Public Health*, 14(3), International journal of environmental research and public health, Vol.14(3).
- [15] Severson, R. L. (2014). The value of (research on) animals in children's lives. *Human Development*, 57(1), 26-29. doi:

[http://dx.doi.org.ezproxy.ccclib.noccd.edu/  
10.1159/000357792](http://dx.doi.org.ezproxy.ccclib.noccd.edu/10.1159/000357792)

- [16] Taraban, Lindsay, and Daniel S Shaw.  
"Parenting in Context: Revisiting Belsky's  
Classic Process of Parenting Model in Early  
Childhood." *Developmental Review* 48  
(2018): 55-81. Web.
- [17] Van Houtte, and Jarvis. "The Role of Pets in  
Preadolescent Psychosocial Development."  
*Journal of Applied Developmental  
Psychology* 16.3 (1995): 463-79. Web.

# Forensic Anthropology in Latin America: Examining Methods of Human Identification

Lourdes Ramirez

*B.A. Candidate, Department of Anthropology & Criminal Justice, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

Received 16 April 2021; accepted 20 July 2021

---

## Abstract

The purpose of this research to examine what forensic techniques have been used through time for positive human identification within the context of mass graves in the region of Latin America. Latin American countries struggle with human rights issues, political violence, and mass natural disasters, which often means there are mass graves in certain regions of these countries. Forensic anthropology teams in Latin America are often responsible for identifying human skeletal remains in these instances. The application of forensic anthropology techniques and methods is analyzed throughout time, and little change is observed within these methods. The techniques that have been most useful in identifying victims in these countries are discussed, such as DNA analysis and dental records.

*Keywords: Latin America, Forensic Anthropology, Human Identification, Human Rights, Political Violence*

---

## Introduction

Latin American countries are more likely to suffer from political violence, natural disaster, and mass disasters which often result in mass graves. These mass graves are filled with un-named victims and at times are not discovered until years later. Police and government officials do nothing when it comes to trying to identifying these victims because of political corruption. It is usually forensic anthropology teams that help with the identification of victims in these specific countries. The most well-known forensic anthropology teams are the Argentina Forensic Anthropology Team (EAAF) and the Guatemalan Forensic Anthropology Team (FAFG). These teams, rather than government or police, perform most of the work for identifying individuals in mass graves. When these skeletonized remains are discovered, it is not a local crime that can be dealt with by the government (Bielous, 2019).

The methods and techniques for human identification in these counties were similar, most of them consisting of DNA analysis, osteological analysis, and the biological profile. Many of these counties have been using the same techniques for years and it seems that they do not get the chance to advance with the techniques used for human identification. Forensic anthropology teams are continuing to use the same techniques that were first used when forensic anthropology was introduced to Latin America (EAAF Guide).

Countries in Latin America have a lack of regional standards in forensic anthropology (Íscan & Olivera, 2000). It is a growing discipline, but it still needs to continue to improve on setting forensic anthropology standards. Each country in Latin America may have different standards to follow in context of forensic science as a whole. An example of this is how some countries use universities and private laboratories to perform human identification techniques, while other countries only allow government laboratories to

employ human identification techniques such as DNA-based genetic identification (Lorente, 1999).

## Forensic Science in Latin America

Countries in regions like North/Central America, South America, and the Caribbean are considered to be a part of Latin America. The countries that suffer the most with human rights violations and political violence are Guatemala, Argentina, El Salvador, Peru, Chili, Colombia, and Brazil. These countries have now grown enough to have their own forensic anthropologists but it was not always that way since Western anthropologists who intentionally involved in the training and the awareness of biological anthropology.

When forensic anthropology in the United States first coalesced into its own discipline in the 1970's, it was expected that U.S. forensic anthropologists would travel to other regions like Latin America to aid in the investigations of finding and identifying the victims of human rights abuses. Now, since forensic anthropology has grown there are more forensic anthropologists who have been trained and are natives to these Latin American countries. While it may be expected for a foreign forensic anthropologist to assist in certain circumstances, there are now more professionals in the forensic science field in their own countries. Various important anthropologists like Clyde Snow and Ellis R. Kerly helped establish physical anthropology and forensic anthropology sections in their own country and in Latin American countries, like Argentina (Ubelaker, 2018).

## The History of the Discipline

Forensic anthropology was created by European anatomists but it was developed in America because there were many high-profile court cases, focused research, and a large donated skeletal collection critical to the establishment

of forensic methodologies (Ubelaker, 2018). In 1972, the American Academy of Forensic Science (AAFS) established physical anthropology as its own section (Ubelaker, 2018). This was, in part, due to Ellis R. Kerley and Clyde Snow. In 2015, the physical anthropology section changed its name to anthropology to broaden the scope and accommodate practitioners of archaeology. In 1977 and 1978, Ellis R. Kerley led the creation of the American Board of Forensic Anthropology (ABFA). This organization set up a certification process that was examination-based and initially certified diplomates (Ubelaker, 2018).

While early forensic anthropology was primarily based on analyzing skeletal remains, it soon diversified into a broader field that included decomposed remains, skeletal trauma analysis, war deaths, and diverse techniques of human identification (Ubelaker, 2018). Forensic anthropology now includes search and recovery, age estimation, new computer techniques, isotopic analysis, biomechanics of trauma interpretation, human rights investigations and many other aspects of human identification (Ubelaker, 2018). It continues to grow as a discipline as we are introduced to and continue to advance more in technology that can be used in the forensic science context.

When Clyde Snow arrived in Argentina in 1984, he was able to establish the use of forensic anthropology in political violence cases (Fondebrider, 2012). Clyde Snow was interested in aiding Latin America because of the large amount of people who would be kidnapped, killed, and buried throughout the "Dirty War" in Latin America. After this war, he continued to consult and train colleagues in order to help find the Argentina Forensic Anthropology team (EAAF), this team was able to aid in investigations of political violence (Ubelaker, 2018). In 2003, the Latin American Association of Forensic Anthropology was formed. This organization is able to provide training, education, and experience to those individuals who want to be certified as a forensic anthropologist.

### **Human Right Violations/Political Violence**

Many countries in Latin America suffer human rights abuses as a result of politically driven conflicts and violence. This could mean that people in power are killing and hurting the citizens they are supposed to serve. Many people lose their family members and have no idea what happened to them. Historical changes have caused many problems for citizens in these countries. The political system is turned against the people due to a military dictatorship, which is being attacked since people want to facilitate a democratic elected government (Friedenberg, 2001). Political violence can include concepts like humanitarian issues, human rights violations, war crimes, and genocide (Fondebrifer, 2012).

The dictatorship era in Latin America left a large number of people dead and also left many people missing. When these human rights violations happened, it caught the attention of the International Committee of Red Cross (ICRC) and independent forensic teams (Calmon, 2019).

Missing people are not accounted for, such as the people who are already declared dead. A lot of Latin American countries began improving on the discipline of forensic science when the investigation of political crimes was on the rise in the 1960's and 1980's (Calmon, 2019). Not every country developed forensic anthropology in the same way. Brazil stands out because the development of forensic anthropology was connected to legal medicine. Most forensic anthropologists in Brazil only need a Bachelor's degree plus training in health disciplines in order to be considered a forensic anthropology expert (Calmon, 2019).

Forensic anthropology is becoming a bigger discipline in Latin American countries, due to the fact that they need to identify large amounts of people. While other countries like the United States and the United Kingdom began using forensic anthropology as an aid to the medico-legal community (law enforcement), Latin American countries had to use it in order to meet the demands of all the deaths that were connected to political crimes (Fondebrider, 2012). Anthropologists who work in Latin America usually do not have one occupation, they work with various organizations. They could have multiple jobs such as teaching in a university, government positions, private sectors, working in international organizations, and working with human right organizations. They get paid low wages no matter if they are working directly or indirectly in academia (Friedenberg, 2001).

### **Forensic Anthropology in Latin America**

Forensic anthropologists in Latin America usually are approached by family members in order to find victims or the "disappeared". This is why many forensic anthropologists must have a connection with the families of victims. Not only will they be collecting DNA from the victim's families, but they need to be able to share the good and bad news of the investigation. At times, a victim may not be from a political crime but they may be from a mass disaster, which may still require a mass amount of people to be identified and investigated.

Different phases comprise the investigation, recovery, and the analysis of human remains. There is a preliminary investigation, archaeological phase, laboratory phase, identification process, and lastly release the results to family or the community (EAAF Guide). These phases must all be interconnected with one another in order to make it a clear and manageable investigation. The preliminary investigation may require the most work since one needs to look at written sources, work with oral sources and collect the antemortem data that includes getting biological samples for genetic testing from the victim's biological family. The family usually reaches out to these forensic anthropology organizations to get answers for their missing relatives and some may comply with what information the anthropologists request while others may be afraid to share this type of information.

Some challenges persist with forensic anthropology in Latin America that include having no local bone or dental standards, no accurate reporting of the actual

amount of people who are missing in an investigation, and a lack of information in the expert reports that professionals must fill out (Ubelaker, Colantono, & Smithsonian, 2019). There are issues with funding as well when it comes to studying and recovering mass graves. In Argentina and Chile, different State agencies may be able to fund these projects but other counties are not as fortunate (Ubelaker, Colantono, & Smithsonian, 2019). Universities in Latin America may not be able to participate in these projects because of the funding and risks involved. Also, since political violence is an issue, it may be risky for people to work at burial sites that are monitored by State police and victim's families (Ubelaker, Colantono, & Smithsonian, 2019). It could be dangerous for people to work at burial sites since there are police officers and family members surrounding the work area. Also, the victimizers who could have been responsible for these human rights violations are still free and still hold a share of power.

### **Search & Recovery Methods**

The first step towards search and recovery usually includes a preliminary investigation that requires using oral and written sources to lead investigators toward the location of the graves (Bielous, 2019). While doing the preliminary investigation they will also try to retrieve information of the characteristics of the victims and as well try to reconstruct the event in a historical context. Maps and sketches from witnesses can help recognize the spot. Also taking aerial photographs, using satellite photographs, and using archaeological prospection can help locate the site (EAAF Guide).

After forensic anthropologists receive this information, they can conduct surveys in order to find mass graves. They can use a ground-penetrating radar (GPR) and a proton magnetometer to look for mass graves. GPR is able to send radar waves through ground to sense the presence of bodies and a proton magnetometer is able to detect small changes in the Earth's magnetic field and this can help find gravel pits since digging through soil disturbs the electromagnetic properties (Sachse & Guzman, 2012). This means that any soil in which human remains were buried will come up on the GPR monitor screen since this detects any physical and chemical changes in the ground. GPR also ensures that no site is destroyed since it is a non-invasive survey method for searching for mass graves. GPR is able to create a map of how the site looked like before it was disturbed. So, for these mass grave cases, it would be before any human remains were buried. Flotation can keep track of small artifacts found in these mass graves and using a geographical information system (GIS) is a way to store coordinates and data of excavation sites as materials are recovered. While at these excavation sites, tools such as shovels, trowels, anthropometers used for anthropometric measurements, boley gauges to measure dental materials, spreading calipers to measure the thickness and internal/external diameters of skeletonized remains, and heat-sensitive infrared cameras will be used to locate new graves, excavate the found graves, and to measure skeletal

remains (Sachse & Guzman, 2012).

### **Excavation**

There are different types of localities where bodies may be found such as: clandestine cemeteries, surface sites, discrete excavated graves, or in rivers, lakes, or oceans (EAAF Guide). After a potential mass grave is discovered, a team gets ready to conduct an archeological excavation. The goal is to search and recover the bodies. Mass graves, synchronic graves, diachronic graves, disturbed graves, and altered graves may all be a classified type of grave in which mass amounts of victims are found. Mass graves are often hastily dug pits where a large amount of human remains are dumped. Synchronic graves are also considered mass graves but all the bodies were deposited during the same burial event. A diachronic grave are mass graves where the bodies were buried during different burial events. A burial site may be disturbed as a result of natural processes or altered intentionally by human action (EAAF Guide). Even within the same burial context, bodies can be found in different states of preservation, and their conditions can vary.

Once the grave is found, steps such as determining if the area is on private property, preserving and isolating the area, and making sure there are no threats of danger are important to remember. Also, documentation of the site is critical, so archaeologists must track the location with a GPS, photo-document the area, check if the site will be modified by humans or by natural processes, employ safety and security procedures, and find a way to communicate with community members where the remains are located (EAAF Guide).

The recovery of remains during the excavation process will go through receiving a site code, documentation, packaging, chain of custody, and transportation. Families are allowed to watch the exhumation under the site protocol and they can perform any needed cultural or religious rituals as long as they do not disturb the site (EAAF Guide). Families also have the right to know how bodies will be exhumed and the preliminary findings. Many Latin American countries do have a focus on supporting the victim's family. This is unique to Latin America because families are usually the people who reach out to forensic anthropology teams in order to help find their loved ones.

After the remains are recovered, they are sent to the laboratory to be assessed. The remains will go through receiving a basic biological profile which will consist of estimating sex, age, ancestry, and stature. They will then be given a dental analysis, analysis of pathologies, anomalies, trauma analysis, and distinction between taphonomic processes and perimortem wounds (EAAF Guide). This is critical information that informs not only the identification of an individual, but also the potential cause and manner of death. Sampling for genetic testing may be conducted after all analyses have been performed, and if genetic testing was not conducted it was due to rare circumstances (EAAF Guide). The Argentina Forensic Anthropology team lead an example for many other countries in Latin America and their

guide is similar to many forensic anthropology teams because the Argentina Team was one of the first and most advanced teams since forensic anthropology was introduced in Latin America.

In some circumstances, remains will be analyzed with gas chromatography/mass spectrometry (GC/MS), forensic radiology, computerized tomography (CT), or magnetic resonance imaging (MRI). In a mass fatality incident, GC/MS is used by extracting osseous materials from the skeletal remains and once this material is in the GC/MS instrument it can generate traces that are distinctive to a individual (Edson & McMahon, 2019). Forensic radiology can be used to compare the antemortem and postmortem radiographic records of an individual to confirm an identification (Kahana & Hiss, 1997). Radiographic markers are used in order to compare and identify victims. Using CT scans for human identification is similar to forensic radiology. With a CT scan, lateral scout views and skull X-rays are utilized for identifying victims (Haglund & Fligner, 1993). A lateral scout view would be a digital radiograph of the lateral view of the skeletal remains. MRI scans can be used as well, this method gives detailed images of the soft tissues in the body. If enough tissue is on the individual facial recognition can be conducted on victims with cranial MRI scans (Schwarz et al., 2019).

### Techniques

A greater proportion of forensic anthropology work in Latin American countries is done in the field instead of a laboratory. However, there are some things that can only be performed at a lab, and this has to do more with positively identifying the individual. At times, gas chromatography will have to be used in order to find the amount of poison that was in a body. Forensic radiology is a useful tool for severely destroyed remains. Using techniques such as x-rays, computer tomography, and MRIs can also help determine the cause of death (Sachse & Guzman, 2012). In Uruguay, the field of forensic anthropology is still developing along with the rapid advances in analytical technologies. Human remains used to be analyzed by coroners with little training but now there is a lab that is dedicated to forensic anthropology. Techniques such as facial image analysis, comparing DNA fingerprints, and examining dental records are the most popular techniques that are used (İscan & Oliver, 2000). Forensic anthropology research is rare to Central and South America which may explain why newer human identification techniques have not been introduced. Countries such as the United States and the United Kingdom are able to focus primarily on conducting forensic anthropology research, but anthropologists in Latin American countries may not have the time and resources in order to continue to grow and continue to advance the technology of forensic anthropology. While these techniques are reliable, Latin America needs to be introduced to newer techniques in order to solve cases quicker and to lessen the workload.

A basic biological profile is always the first step for the forensic anthropologist. This is helpful in order to get

the basic and useful information of the victim they are trying to identify. Forensic anthropologists in Latin American countries rely heavily on the biological profile in order to get the age, sex, stature, ancestry, and any unique traits. This can be useful to families as well because it could be easy to compare and contrast the medical documents they have of their missing loved one.

In Ecuador, human identification for victims of political violence is based on the established anthropological techniques. The identification process that takes place after human remains are found include getting fingerprints, if possible, estimating the biological profile, estimating their social status and ethnicity, the types of bones, and the cause of death (Ubelaker, Coantonio, & Smithsonian, 2019). In Chile, comparing the antemortem and postmortem information was essential to connect with the victim's family relatives. Families called for action to identify individuals after they had discovered missing detainees skeletal remains, which were not being identified by the government. Chilean forensic anthropologist used skull photo superimposition, dental x-rays, and the biological profile to identify unknown skeletal remains (Bielous, 2019).

In Uruguay, they also use simple techniques of identifying victims. In the case of *Operación Zanahoria*, which was an operation in which the military killed citizens and hid the fact that they committed this crime, they only left skeletal fragments of citizens. DNA tests were conducted, but professionals could not extract DNA from the human radius and the DNA they took from the fibula remains they found had no matches in the DNA banks (Bielous, 2019). Forensic anthropologists were able to provide evidence of what actual happened with archaeological evidence that is backed up with expert and legal evidence. The bodies were identified by their location because the dictatorship refused to grant relatives the body (Bielous, 2019), There are international standards when it comes to recovering skeletal remains during excavations and Uruguay broke those protocols by not protecting the skeletal remains that were recovered (Bielous, 2019). Uruguay also relied on techniques such as facial reconstruction when forensic treatments were being used in 2005. This technique is not reliable due to the low correlation between the human skull and the features of the face (Ubelaker, 2007).

Peru follows a similar pattern with these countries. In Peru, the law only permits fingerprint, odontograms, and DNA as accurate forms of identification (Bielous, 2019). Peru identifies victims through a traditional forensic anthropology method called positive presumptive identification. This requires that the victims' family share the individual personal characteristics and forensic anthropologists compare that to the postmortem information of the skeletal remains (Bielous, 2019). Victims who have already been lost for longer than ten years will not have much of a success rate in positive identification.

Brazil uses some of the same methods as other Latin American countries. They use comparative

antemortem and postmortem methods, forensic sculptures, digital facial reconstruction, dental evidence, and the biological profile (Ubelaker, Colantonio, & Smithsonian, 2019). Research continues to be conducted in Brazil in order to advance forensic fields. There is still a long way to advancing the methods in Brazil and all other Latin

much more detailed planning. With the amount of human skeletal remains that are commingled, it may be difficult to apply identities to all remains, especially when remains are in fragmentary condition. It is advised that only bones that have been genetically marked or bones that have been identified with the use of odontology, pathology, or

**Table 1. Most Commonly Used Human Identification Techniques/ Methods by Country in Latin America**

| Country   | Techniques/Methods  |
|-----------|---|
| Argentina | DNA Analysis, Biological Profile, Dental Records  |
| Guatemala | DNA Analysis, Biological Profile, Dental Records  |
| Uruguay   | Fingerprints, Biological Profile, DNA Tests, Facial Reconstruction, Skull Superimposition                                     |
| Ecuador   | Fingerprints, Biological Profile  |
| Chile     | Antemortem and Postmortem Information, Skull Superimposition, Photographs, Dental X-Rays, Biological Profile                  |
| Peru      | Fingerprints, Dental Records, DNA Tests   |
| Brazil    | Antemortem and Postmortem Information, Forensic Sculptures, Digital Facial Reconstruction, Dental Records, Biological Profile |

\*Chart Information comes from (Ubelaker, Colantonio, & Smithsonian, 2019)

American Countries.

Forensic anthropology and the application of archaeological methods are important components that will aid these countries in their fight to identify people from mass graves.

Research such as analyzing the palatal rugae has begun in Latin America as a means of identifying people. The palatal rugae, which may also be called the transverse palatine, are the ridges on the anterior of the palatal mucosa. These ridges are formed with the front of the tongue and it forms a unique structure in the hard palate that can be analyzed for forensic identification – like a fingerprint. It is a new analytical-description method that can help identify victims if their unique features have been altered or if their body has decomposed and has been transformed (Blanco, Bollini, & Atencio, 2019). This method is less costly and the information can be collected rapidly. It is more helpful in the cases where the individuals were victims of a violent crime or catastrophe. With the use of this method, it will provide a standardized framework for providing rugoscopic information (Blanco, Bollini, & Atencio, 2019). This method can enrich the techniques that forensic science is already using for human identification.

**Commingled Remains**

In examination of mass graves, multiple skeletal remains are bound to be recovered. Commingled human skeletal remains means that there is a mixing of the bones of two or more people. One of the responsibilities of the forensic anthropologist carries within the context of human rights violations is proving that multiple individuals residing in a common grave was purposeful and could have not been a coincidence (Fleischman, 2016).

A mass grave with commingled remains always requires

radiographs can be repatriated or positively identified. (Varas & Leiva, 2011).

When a mass grave is first determined to have commingled remains, it is standard procedure to count the number of bones found and to estimate the minimum number of individuals (MNI) (Egana, Doretti, Bernardi, & Ginarte, 2008). After this, the bones might be sorted, analyzed and an attempt to determine biological profile or profiles might proceed. The analysis that takes place after the remains are recovered is done in order to reunite the largest number of individuals from all the mixed remains. When investigating a case with commingled remains, a positive identification can only be given with osteo-anthropological data and DNA testing results (Egana, Doretti, Bernardi, & Ginarte, 2008).

**Results & Conclusion**

Forensic anthropology in Latin America has made some advancements, but it has not kept pace with other countries around the world. Throughout analysis of other research articles, it can be seen that methods or techniques that are most likely to be used in Latin America in context of mass identification are those of DNA analysis, comparative dental records, and analyzing a biological profile of the skeletal remains. It is important to note that all skeletal remains will have a biological profile, but often the profiles are very similar so they cannot be used to confirm positive identification until another method is used. These techniques have been implemented ever since forensic anthropology was introduced into these countries. It seems that there has been little change in methods and their application when it comes to identifying skeletal remains in



mass graves.

Along with the biological profile, forensic anthropology teams in Latin America use DNA analysis most frequently because it is reliable and accessible. However, DNA analysis may be expensive and only a few labs can work in extracting DNA from bone remains (Egana, Doretti, Bernardi, & Ginarte, 2018). The families of victims are usually involved when forensic anthropology teams are conducting an investigation, recovery, and analysis of skeletal remains in mass graves. If the forensic anthropologists who work for these teams are able to obtain DNA from family members to compare to the remains, a positive identification is possible. Dental records can also provide a positive identification, but this technique can only be used if the missing individual has available dental records.

While there is research proceeding in Latin America countries exploring new techniques for human identification, there has been very little change in applications of these techniques for positive human identification. Forensic anthropology teams are usually the ones conducting the actual analysis for human identification on recovered skeletal remains in mass graves, and they are continuing to use well known techniques that they depend on to lead them to a positive identification. In the future, this may change but at the time being, these techniques will continue to be used in Latin America. There are limitations to forensic anthropology in these countries because there is little collaboration between the forensic anthropology teams and the universities that have funding to conduct research on human identification.

Forensic anthropology as an academic discipline, continues to grow in Latin America. With the creation of more courses at all levels in forensic anthropology, forensic archeology, and the creation of standards related to forensic science, the field of forensic science can develop at a quicker rate. If more funding becomes available for forensic science in countries of this region, it can be used towards supporting research for more recent techniques of human identification and the training of professionals in the discipline. One critical limitation is that forensic anthropology teams are not connected to the research that is being conducted in universities. There is an urgent need for greater collaboration between universities and forensic anthropology teams to continue to advance the discipline.

It is not only forensic anthropologists that aid in these human identification cases. A legal team, people with knowledge in international affairs, and people who can work with the victim's families are necessary when conducting these investigations. The use of advancing techniques and methods is still under development. There already is a demand to improve DNA testing by making it more efficient. Also, there is a need for the implementation of a quality management system for all the forensic work. However, since these countries often face economic difficulties, it may be hard to make these advancements very quickly (Bingham, 2020). While Latin American countries struggle to advance their forensic methods, there is still

growth in the educational opportunities in the field. The desire to implement standards is especially valuable to the training of new professionals in the discipline.

### Acknowledgements

A special thank you to Dr. Sari Miller-Antonio for mentoring me through this project. Thank you to the CSU Stanislaus McNair Staff, the CSU Stanislaus Honors Program, and every professor and classmate that has supported me and this research.

### References

- [1] Argentine Forensic Anthropology Team (EAAF). (2020). *Forensic Guide to Investigation, Recovery and Analysis of Human Skeletal Remains*. Retrieved from <https://eaaf.org/guia-forense-para-la-investigacion-recuperacion-y-analisis-de-restos-oseos/>
- [2] Bielous, S.D. (2019). *Forensic Anthropology Teams in Latin America* (1st ed.). Routledge. <https://doi.org/10.4324/9780429031335>
- [3] Bingham, C. (2020). The ISHI Report May 2020 - Advancing Forensic Science in Latin America. <https://promega.foleon.com/theishireport/may-2020/advancing-forensic-science-in-latin-america/>.
- [4] Blanco, L., Bollini, G., & Atencio, J. P. (2019). Nueva Propuesta De Clasificación, Codificación Y Análisis De Las Rugas Palatinas. *Zaranda de Ideas: Revista de Jóvenes Investigadores En Arqueología*, 17(2), 53–65.
- [5] Calmon, M. (2019). Forensic anthropology and missing persons: A Brazilian perspective. *Forensic science international*, 298, 425-e1.
- [6] Egaña S., Turner S., Doretti M., Bernardi P., Ginarte A. (2008) Commingled Remains and Human Rights Investigations. In: Adams B.J., Byrd J.E. (eds) *Recovery, Analysis, and Identification of Commingled Human Remains*. Humana Press. [https://doi.org/10.1007/978-1-59745-316-5\\_4](https://doi.org/10.1007/978-1-59745-316-5_4)
- [7] Fleischman, Julie M. (2016) "Working with the Remains in Cambodia: Skeletal Analysis and Human Rights after Atrocity," *Genocide Studies and Prevention: An International Journal*: Vol. 10: Iss. 2: 121-130. DOI: <http://dx.doi.org/10.5038/1911-9933.10.2.1411>
- [8] Fondebrider, L. (2012). The application of forensic anthropology to the investigation of cases of political violence.
- [9] Freidenberg, J. (2001). Applied anthropology /antropología de la gestión: debating the uses of anthropology in the United States and Latin

America. *Journal of Latin American Anthropology*, 6(2), 4–19.

- [10] Haglund, W. D., & Fligner, C. L. (1993). Confirmation of human identification using computerized tomography (CT). *Journal of forensic sciences*, 38(3), 708–712.
- [11] İşcan, M.Y., & Olivera, H. E. S. (2000). *Forensic anthropology in Latin America. Forensic Science International*, 109(1), 15–30. doi:10.1016/s0379-0738(99)00213-3
- [12] Kahana, T., & Hiss, J. (1997). Identification of human remains: forensic radiology. *Journal of clinical forensic medicine*, 4(1), 7–15. [https://doi.org/10.1016/s1353-1131\(97\)90002-x](https://doi.org/10.1016/s1353-1131(97)90002-x)
- [13] Lorente, J.A. (1999). The GITAD Project: DNA Typing in Latin America. *Geneprint*.
- [14] Sachse, R. (Producer) & Guzman, R. (Director). (2012). *Nostalgia for the Night* [Film]. Atacama productions.
- [15] Schwarz, C. G., Kremers, W. K., Therneau, T. M., Sharp, R. R., Gunter, J. L., Vemuri, P., . . . Jack, C. R. (2019). Identification from MRI WITH face-recognition software. *New England Journal of Medicine*, 382(5), 489-490. doi:10.1056/nejmc1915674
- [16] Suni M. Edson & Timothy P. McMahon (2019) Testing of skeletonized human remains using GC/MS – development of a personal environmental profile, *Australian Journal of Forensic Sciences*, 51:sup1, S115-S118, DOI: 10.1080/00450618.2019.1568558
- [17] Ubelaker, D. H., Colantonio, S., & Smithsonian Institution Scholarly Press, publisher. (2019). *Biological anthropology of Latin America: historical development and recent advances*. Smithsonian Institution Scholarly Press.
- [18] Ubelaker, D.(2018). A history of forensic anthropology. *Am J Phys Anthropol*. 2018; 165: 915– 923. <https://doi.org/10.1002/ajpa.23306>
- [19] Varas, C.G., & Leiva, M.I. (2012). Managing commingled remains from mass graves: considerations, implications and recommendations from a human rights case in Chile. *Forensic science international*, 219(1-3), e19–e24. <https://doi.org/10.1016/j.forsciint.2011.11.035>

# Evaluating the Doctor-Patient Relationship and How it Affects Cases of Obstetric Violence

Brittaney Rigby

*B.S. Candidate, Department of Chemistry, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

Received 16 April 2021; accepted 20 July 2021

---

## Abstract

Pregnancy is a medically vulnerable state for the woman where trust and communication between the pregnant woman and her obstetrician is critical. Obstetric violence is the abuse against woman during pregnancy and childbirth that can occur from healthcare professionals. Though previous studies have suggested the presence of obstetric violence, it has yet to be quantified and nor assess possible causes as to why. Even in life-threatening situations, women should have the right to refuse care such as a “caesarean section, episiotomy, and vacuum-assisted delivery,” and being coerced into procedures can be mentally and physically traumatizing to women. The correlation between a physician’s characteristics and the occurrences of obstetric violence will be investigated and evaluated. It is expected that more empathetic obstetricians who spend more time building a rapport with their patients and with their nurses about their patients will be less likely to commit obstetric violence against their patient. In summary, it is expected that the more empathetic an obstetrician is, the better rapport he or she will establish with their patient and, thus, the less likely the obstetrician will be to commit violence against the patient. A pilot survey was conducted with parameter questions and evaluated a woman’s experiences and determined if a pregnant woman or previously pregnant woman has experienced any number of specified types of violence from medical professionals. It did find that some women did experience incidences of violence from medical professionals.

*Keywords: pregnancy, obstetric violence, cesarean, coerced, empathetic, rapport, communication*

---

## Introduction

Pregnancy is a transient condition unique to women. Though it is tied to the sex of an individual, it is not a defining characteristic in that, although it is necessary to be a woman in order to be pregnant, it is not necessary to be pregnant in order to be a woman. Not only is pregnancy a transient condition, but also a medically vulnerable state for the woman where trust and communication between the woman and her obstetrician is crucial.

Societally, pregnant women are considered vulnerable especially in the context of stress, domestic violence, and low-income, but clinically, pregnant women as a group should not be considered vulnerable because they have the same, “capacity for autonomous decision making as,” [1] their nonpregnant counterparts. Furthermore, it is important for the patient and doctor to trust and communicate with each other in order for the doctor to not override the patient’s rights and choices regarding the patient’s pregnancy.

Obstetric violence is the “physical, sexual, and/or verbal abuse...” intimidation, “...coercion, humiliation, and/or assault that occurs to...” [2] pregnant women and, “...birthing people by medical staff including nurses, doctors, and midwives.” The mistreatment or disrespect of a woman’s rights in childbirth should not occur as it is a violation of a woman’s rights [3] and it can have traumatic mental and physical consequences.

There are many forms in which obstetric violence can occur. There is the rumored “husband stitch,” in which after birth, the physician gives the woman an extra stitch during the vaginal and perineal repair after it was either torn or surgically cut (episiotomy). The extra stitch is called extra for a reason and leads to discomfort during the postpartum recovery process and painful intercourse. To repair a tear or

surgical cut, skin is brought together in order to facilitate the healing process. With the husband stitch, an extra stitch brings together more skin than in order to tighten the introitus (the opening of the vagina) beyond what is necessary which is what causes pain during sex as skin does not have the same elasticity as the muscles of the vaginal canal and vaginal introitus (vaginal opening).

There have been no concrete studies on the husband stitch and most medical professionals consider it a myth since there has only been anecdotal reports from women, but there has been an account of it being performed and reported by a gynecologist in a historical medical journal in 1885 [4]. There is also another account from a doctor’s colleague of a patient asking her doctor before delivery if she could have a husband stitch as she heard that it tightens up the vagina to its original state [5]. The doctor barely won the lawsuit when the woman sued the doctor for malpractice because it was “too tight.” An interesting, yet unmentioned implication about this case was that the doctor was essentially incompetent in that he did not understand the anatomy of a vagina in that the introitus and the vaginal canal is a muscle that can expand and contract and will eventually shrink back to its pre-delivery state [6] and that male sexual pleasure is derived from pelvic floor muscles and the vaginal canal and not just the introitus and yet the husband stitch only tightens the introitus. This makes the husband stitch irrelevant, frivolous, and harmful whether it is asked for by the woman, the woman’s spouse, or performed without the consent of either.

There is also the issue of forced and coerced cesareans as seen in Dray’s pending malpractice lawsuit where she specified, she did not consent to a C-section before delivery and refused it throughout delivery and yet the doctor still performed it. One in three babies are

delivered by C-section in the United States one average. More statistical data is needed about why the rate of C-sections is higher than the ideal rate for C-sections [7] whether it being due to some hospitals having a quota for the number of C-sections they want to perform or whether it is the financial incentive of obstetricians being paid more when they perform a C-section [8] or due to a physician practicing defensive medicine when worried about a malpractice lawsuit [9] or a combination of those three factors and more.

Determining why obstetric violence occurs and how it can be reduced is a human's rights issue as disrespect and abuse during pre-natal care and delivery are violations [10]. The objective of this study was to look at the experiences pregnant women had in order to obtain an idea about the empathy levels of an obstetrician and see what relationship empathy, or the lack thereof, had with obstetric violence. The women were of obstetric violence and which types of violence in hopes of bringing more awareness to this issue to both the medical professionals as well as the pregnant women themselves which is why the survey gathered the data it did.

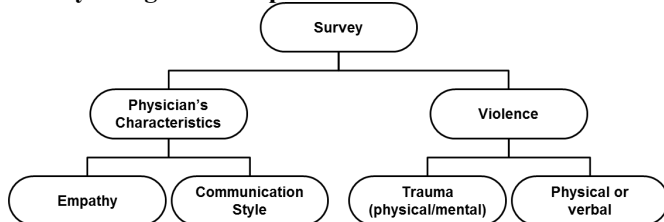
### Methods

This was an anonymous, survey-based study in which women who had previously been pregnant were asked questions about their experiences and quality of care during pregnancy. A survey was conducted asking a sample of women about their experiences during prenatal care, during the birthing process, and after birth. An IRB form was submitted to ensure the protection of human participants in this research study and safeguards (resources for the respondent to reach out to in the case of triggering anxiety, extreme duress, or even a PTSD episode) were put into place in the consent form and at the end of the survey.

### Recruitment

Methods for recruitment involved using Amazon Mechanical Turk (mTurk), a crowdsourcing marketplace for participants. The target sample size were women respondents ages 18 years and older who have had a full-term pregnancy and who have had medical professionals attend to them in a medical facility. There are incentives raffle prize to have a chance at obtaining one of six visa gift cards that are \$35, \$25, or \$15 in addition to being paid twenty cents for completing the survey through mTurk.

### Survey Design and Scope



**Figure 1.** Summary of the elements of the survey. The survey consisted of 32 questions identifying a physician's characteristics based on the presence of empathy and types of communication. The survey also identified the incidence of violence and whether the violence experienced was

physical and/or verbal and if it led to either physical and/or mental trauma during their pregnancy, whether in the past or current.

The type of information obtained from participants determined whether or not they have been pregnant, having them answer the question if they have experienced obstetric violence from a medical professional. Furthermore, the survey asked more specifically if they have experienced a vaginal exam without consent, a forced cesarean surgery, physical force to prevent birth while waiting on the doctor to arrive, physical restraint during birth, sexual comments/sexual assault during exams or procedures, bullying on a medical professionals part in order to coerce the participant into a certain procedures (e.g. episiotomy or C-section when it is not medically necessary for the patient to have one performed on the patient), the participant not being given the ability to consent, not being educated on what procedures the physician will do and not being informed of possible repercussions thus the participants was not able to give informed consent, and being mistreated in a disrespectful way without regard for the participant's autonomy.

Other information obtained from the survey will be to question the participants who were or are pregnant and whom have a primary physician at a medical hospital and who have or will give birth at a hospital. The survey questions also evaluated the interactions the participants have had with their medical care team and how they interacted with the participants. The information obtained from this will narrow down or identify what key characteristics of a physician that are present in cases of obstetric violence. The goal of this section was to categorize how the physicians communicated with their patients and would be determined to be noncommunicative, communicative and responsive, or communicative and non-responsive. The characteristics of a physician were used as a marker to indicate the presence and level of empathy a physician had with the participant, the pregnant patient.

There were several disqualifiers in the survey on Qualtrics to automatically screen out participants as seen below in Table 1. As mentioned in the footnotes, a qualifier on mTurk was having the gender of respondents being set to true so only female mTurkers will be able to view and thus take the survey on mTurk. Parenthood status was also set to true as well so only mTurkers who have had a child could only view and take the survey on mTurk.

### Data Analysis

The survey was created on Qualtrics and the responses were recorded there to export to excel for data analysis.

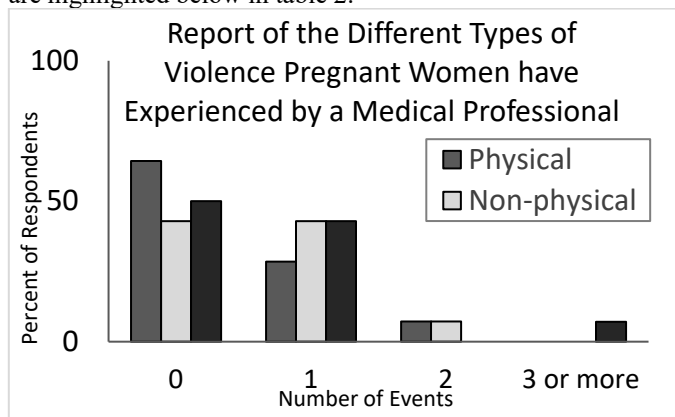
Qualtrics recorded fifty-two respondents. Eight respondents listed themselves as male and had to be rejected from the sample size. Though setting the standard to reject males from the survey may seem arbitrary the fact that this group chose male in a survey for women who gave birth indicates that they were not paying attention and demonstrated that the male category was inherently problematic. This group among others in the sample size also had other indications of lack of participant awareness

like contradictory answers (e.g., working forty years in the medical health field yet stated his age as a twenty-eight-year-old male). There were also respondents who gave multiple contradictory answers (e.g., a respondent reported “no” to their decisions and choices that guided the maternity care and delivery process, then saying the caregiver always involved them in decisions about prenatal care, and then also said they were treated with “care and kindness,” “dignity and respect,” and then with “disdain and contempt.”). These respondents were rejected for lack of participant awareness. There were also respondents who only answered the consent form but did not complete the survey. This left only fourteen approved respondents with reliable and quality data. One respondent out of fourteen, when analyzing the last question of the survey that asked the participant if they experienced obstetric violence said prefer not to answer. This respondent was removed from the sample for analysis in figure 3.

### Results

The importance in asking those specific survey questions was that the participants may not consider what they have experienced to be obstetric violence, or they may feel too ashamed to admit that they have experienced obstetric violence. These questions under were parameter questions to determine whether or not the participants have experienced obstetric violence or not.

In order to assess the prevalence of obstetric violence, the survey section “Impression of Care” section, multiple questions were categorized into types of violence as physical violence, non-physical violence, and if it led to trauma. However, the types of experiences were analyzed, but the frequency in which the individual had those experiences were not. Therefore, the data in figure 2 represents the diversity of the types of violence experienced and not the overall individual incidences. Some questions are highlighted below in table 2.

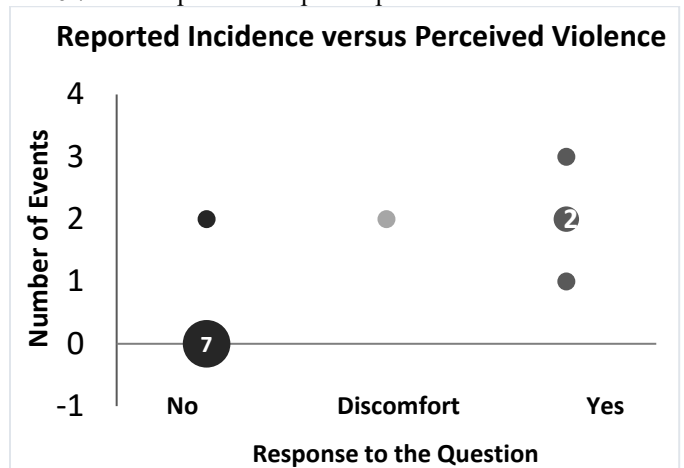


**Figure 2.** Summary of the different types of violence respondents reported to experiencing. Most of the respondents had experienced none of the different types of events of violence from a medical professional whereas some respondents had experienced some incidences of physical violence, non-physical violence, and trauma from medical health professionals.

**Table 2.** Highlight of some answers that indicate the presence of physical violence, non-physical violence, and if it led to trauma.

| Incidence of Violence | Answer   |
|-----------------------|--|
| Physical              | A forced cesarean surgery even though you nor the baby were not experiencing medical distress                        |
| Physical              | Nurses restraining legs closed to prevent the birth of the baby while waiting for the doctor to arrive               |
| Non-physical          | Inappropriate sexual comments during prenatal checkups, examinations, procedures, or birth                           |
| Non-physical          | Bullying or coercion into procedures, like induction, episiotomy, cesarean, or natural birth, without medical reason |
| Traumatic             | Less likely to trust a caregiver (medical health professional) again   |
| Traumatic             | Less likely to want to become pregnant/have another baby again   |

Out of the original sample size where 14 responses were analyzed, 26.6% of respondents reported experiencing obstetric violence, 6.7% of respondents reported they have experienced discomfort, but not obstetric violence, 60.0% of respondents reported not experiencing obstetric violence, and 6.7% of respondents reported prefer not to answer.



**Figure 3.** The sample size for this figure does not include the respondent who reported “prefer not to answer,” leaving this figure with a sample size of 13. The figure contains dots proportional to the number of respondents who answered no, discomfort, or yes to experiencing obstetric violence. That data was cross-referenced to the number of types of events of violence the respondent reported to experiencing. The smallest dots labelled without a number are equal to 1 respondent. The number in the other dots represent the number of respondents who answered that way. One participant chose not to respond to this question.

### Discussion

There seems to be a lack of knowledge of what obstetric violence see since women reported to experiencing different types of violence by medical professionals throughout the survey and yet still reported “no,” or they experienced “discomfort, but would not call it violence.” This is interesting to note because it shows a discrepancy between knowing one has experienced violence while not recognizing it as such as seen in figure 3. This could be due to shame or other feelings in not wanting to admit to the severity of the situation, it could be due to that it may be easier to cope with thinking one did not experience abuse,

or the person simply did not know that what was experienced was actually a case of violence. Whatever the reasons may be, will have to be investigated for further research.

For future research, it would be better to first have a study looking at incidence of violence alone where we ask if a participant has had a violent experience. Once that is established, the study can then ask if that experience occurred during pregnancy and that can be expanded to asking if it was a medical health professional who was violent to the participant.

There was much learned about the process of research, creating a thesis, research experimental design in terms of creating a survey, and not only analyzing data obtained, but also whether or not the data is reliable.

Another part of the thesis mentioned how physicians also communicated with their nurses about their patients. Although the survey did not have any questions to evaluate this, I still think is critical to have this type of communication in the medical health field because it helps keep the physicians and nurses up to date with each other about their patients and it also helps keep both accountable and responsible to their patient. This would be another element to investigate for further research.

I believe it is important to evaluate the levels of empathy a physician has for his or her patients in order to ensure the best quality care possible. We can look to see if there is a correlation could be made between the amount of empathy a physician, or any medical health professional, has. With how essential empathy is in the field of medicine, to the point where medical schools are looking into developing their curriculum to include courses on empathy, this study could be a starting point into for looking into how empathy affects the level of rapport a physician can have with his or her patient and the level of quality care provided. This could be a great starting point to make training courses to help physician with this necessary skill on how to communicate with empathy.

### Acknowledgements

I thank Dr. Jamila Newton, Ph. D., for being my mentor throughout this project. Her advice, criticisms, and insight were necessary in getting this study to where it is now. She taught me how conduct research starting from creating a focused thesis, experimentally designing a survey, not only how to analyze the data but also determining participant awareness for quality data, and how to analyze results obtained.

I also thank Lisa Lewis, my peer, who helped me understand that this is a good topic to have for a study and that obstetric violence is more common than one would think. She also helped provide sources and guidance with publishing the survey online.

I would also like to thank my peers in class for offering advice and criticisms.

### References

- [1] American College of Obstetricians and Gynecologists. (2015) *ACOG Committee Opinion No. 646*. Washington, DC: American College of Obstetricians and Gynecologist.
- [2] Terreri, C. (2018, July 20). What Is Obstetric Violence and What if it Happens to You? *Lamaze International*. <https://www.lamaze.org/Giving-Birth-with-Confidence/GBWC-Post/what-is-obstetric-violence-and-what-if-it-happens-to-you>
- [3] World Health Organization. (2014). *Prevention and elimination of disrespect and abuse during childbirth*. [https://www.who.int/reproductivehealth/topics/maternal\\_perinatal/statement-childbirth/en/](https://www.who.int/reproductivehealth/topics/maternal_perinatal/statement-childbirth/en/)
- [4] Paine, J. F. Y., & Cooke, H. P. (1885). Section on Gynecology. *Transactions of the Texas State Medical Association, Seventeenth Annual Session* (pp. 43). Draughton & Lambert, printers.
- [5] Imerman, H.M., Dewey, T., & Blanchard. (1958). *What Women Want to Know: A Noted Gynecologist's Guide to the Personal Problems of Women's Health* (pp. 134). New York: Crown.
- [6] Davis, K. (2020, June 23). *Husband stitch: Myths and facts?* Medical News Today. Retrieved from <https://www.medicalnewstoday.com/articles/husband-stitch>
- [7] World Health Organization. (2015). *WHO Statement on Caesarean Section Rates*. (2019). [http://apps.who.int/iris/bitstream/handle/10665/161442/WHO\\_RHR\\_15.02\\_eng.pdf;jsessionid=09278FB0BAD3F7B4B43111F1DC18F607?sequence=1](http://apps.who.int/iris/bitstream/handle/10665/161442/WHO_RHR_15.02_eng.pdf;jsessionid=09278FB0BAD3F7B4B43111F1DC18F607?sequence=1)
- [8] Vedantam, S. (2013, August 30). *Money May Be Motivating Doctors to Do More C-Sections*. National Public Radio. <https://www.npr.org/sections/health-shots/2013/08/30/216479305/money-may-be-motivating-doctors-to-do-more-c-sections>
- [9] Cheng, Y. W., Snowden, J. M., Handler, S. J., Tager, I. B., Hubbard, A. E., & Caughey, A. B. (2014). Litigation in obstetrics: Does defensive medicine contribute to increases in caesarean delivery? *The Journal of Maternal-Fetal & Neonatal Medicine*, 27, 1668–1675.
- [10] Frenkel L.A., Stinger, G., & Gray, A. (2013) Introduction: What is Respectful Maternity Care and why is it important (pp. 2). *A Guide for Advocating for Respectful Maternity Care*.

# Estimating a Minimum Income Level for Local College Students

Marcus Ruddicks

*B.A. Candidate, Department of Economics, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

Received May 2021; accepted 20 July 2021

---

## Abstract

The basic needs approach measures poverty based on people's ability to acquire the minimum resources necessary for their survival, but there is not a universal definition of basic needs. Previous researchers have found that the local level is the best one at which to administer antipoverty efforts, so it follows that the local level will be the best at which to measure and define poverty. This study seeks to combine both these ideas and arrive at a local, basic needs-based definition of poverty. To do this, a Qualtrics survey was sent to 1000 students at California State University, Stanislaus regarding the dollar amounts that they generally spend each month on different categories of basic needs. 61 total responses were received, and a minimum income level was calculated using these data. That minimum income level was greater than the 2020 U.S. national poverty threshold for single-person households, suggesting that my calculated minimum income level may be a better fit for local college students.

*Keywords: minimum income level, basic needs, poverty, college*

---

## Introduction

Poverty is a problem that governments at every level are called upon to address, but for them to even attempt to tackle the issue, they need a clear definition of what poverty is first. Poverty is usually vaguely defined as a shortfall in income or the inability to meet basic needs like clothing, shelter, and food, but there has never been one universal definition. This has led to the development and implementation of many different approaches to measuring and defining poverty throughout the years that have been met with varying success.

My study is based on the basic needs approach to measuring poverty, which deems an individual to be in poverty if they are unable to cover their basic needs with their current household income. As stated above, a person's basic needs can generally be described as the bare necessities, but there are not exact criteria for what qualifies as a "necessity." Adam Smith, commonly regarded as the father of modern economics, defined necessities as the goods necessary for survival and "also all commodities which by habit and custom were regarded as 'necessary to the lowest rank of people'" (Baxter & Moosa, 1996, p. 86). The general idea remains relevant, but the definition of basic needs has necessarily evolved since the 18th century as technology has become more advanced. These advancements have led to all new questions being asked regarding what qualifies as a necessity in the current year: Is a personal car a basic need? What about internet access? Healthcare? A modern poverty definition, especially in the wake of the COVID-19 pandemic, must answer these questions, which is what I sought to do in my research.

In the U.S., poverty thresholds (the "minimum level of resources that are adequate to meet basic needs") are determined annually by the Census Bureau, but the methods used to arrive at those thresholds may be well out-of-date (U.S. Census Bureau, 2017). The official poverty measure, as developed by Mollie Orshansky in the 1960s, uses three

times a 1963 minimum food budget (adjusted to current prices) as the basis for its minimum income level. The rationale for this measurement was to estimate what it would cost an individual to purchase the minimum adequate food, clothing, and housing that they need to live, but given how much spending patterns, technology, and prices have changed since 1963, this measurement may no longer be adequate (U.S. Census Bureau, 2017). For example, simply multiplying a minimum food budget by three does not factor in the disproportionate cost of housing compared to clothing or the necessary expenses on needs that did not exist in the 1960s, such as internet access. The methodology used to determine poverty in the U.S. needs to be updated to the situation of individuals in 2021.

My survey is also based on the ideas that a local definition of poverty is needed to adequately tackle the problem and that college students face specific problems related to their basic needs that need to be addressed. Goldrick-Rab (2018) looked at specific problems that community college students face regarding their basic needs, such as rising tuition costs, eroding grant availability, and the inability for many students to fully support themselves through employment. If a student is unable to fully cover all their expenses because of such problems, they might neglect some of their basic needs such as rent, gasoline, or food in order to divert the money that they do have towards educational expenses like tuition. The inability to meet these basic needs often lead to problems focusing on their studies and poor performance in class, which are serious problems that further underscore the importance of ensuring that basic needs are properly met (Goldrick-Rab, 2018).

Bastiaensen, de Hert, and D'exelle (2005) researched the impact that local institutions have on poverty through two case studies, one in Cameroon and one in Nicaragua. In both cases, they found the local institutional process present to be complex, and in trying to intervene, it

was clear that antipoverty efforts had to be adapted to each situation because what worked for one group would not work for another given the different institutional frameworks in each local area (Bastiaensen et al, 2005). Local contexts matter, and antipoverty efforts should be handled on a case-by-case basis because of this. I believe that a logical conclusion to draw from this research is that, if the local level is the best one at which to eliminate poverty, it is also the best level at which to measure and define poverty as well.

Combining these ideas of modernizing the definition of basic needs, addressing college students' specific issues with poverty, and tailoring antipoverty efforts to local contexts, I decided that determining a basic needs-based definition of poverty specifically for college students attending California State University, Stanislaus using my own list of basic needs in 2021 would be a good starting point. I hypothesized that the definition of poverty that I found would be a better fit than other measures such as the official poverty threshold because my definition better reflects the specific situation of local students' needs.

## Methods

### Data Collection and Survey Design

I tested my hypothesis by collecting my own human subject data to determine what students actually spend on their basic needs each month and calculating a minimum income level using that data. To do this, I created a 12-question survey using Qualtrics software and sent it to a randomized sample of 1,000 current students at California State University, Stanislaus. Demographic characteristics such as age, race, and gender were not considered. I received 61 total responses to my survey, a response rate of about 6.1%. Respondents were not compensated, which may have contributed to the low response rate.

My survey begins with the informed consent document containing the relevant information about my survey for respondents and a list of links and resources for students who may currently be struggling to meet their basic needs. Even if students decided not to participate in the survey, they still received the links and information included in the informed consent document. The survey then moves into two demographic questions regarding the student's degree type (undergraduate or graduate) and whether they are the only person contributing to their basic needs or the basic needs of others in their household.

The main focus of the survey was the next eight questions regarding the dollar amount of money that the respondent generally spends on certain categories of their basic needs (food, housing, transportation, clothing, utilities, internet and/or phone service, healthcare and medical services, and education excluding tuition) each month. I used these specific categories because they reflect the situation of a current California State University, Stanislaus college student in a way that other definitions do not. Generally agreed upon basic needs such as food, clothing, and housing are included, as are some overlooked needs such as healthcare, transportation, and utilities. Necessary expenses for a modern college student are also a part of the survey. I included education, internet, and phone service because these are essential to modern college

students, especially after the widespread switch to remote learning due to the COVID-19 pandemic.

A final question on the survey asks, "If you answered 0 to any of the above questions, why?" to determine subjective reasoning behind not paying for certain needs, be it from neglecting that need or from the expense already being covered through financial aid or family support.

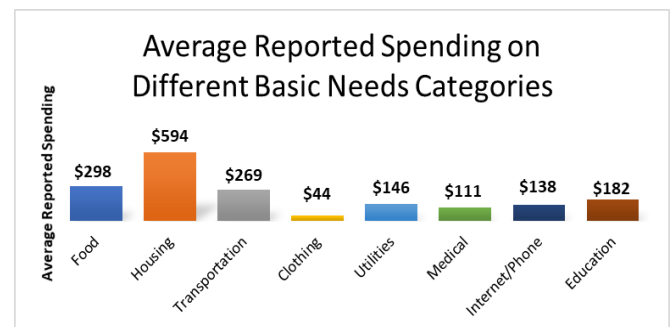
### Calculations

As was mentioned previously, I used the quantitative data collected from my survey to calculate a minimum income level for local college students. The responses for each category of basic needs were looked at individually and then averaged. I calculated average reported spending on food, average reported spending on housing, and so on. Eight total averages were calculated, and these averages were then added together to arrive at a monthly minimum income level based on respondent data. Finally, I multiplied the sum of these averages by twelve to determine an annual minimum income level for the relevant population, students in and around Stanislaus County.

Four total minimum income levels were calculated in a similar way but treating outliers differently. Problems with respondents misreading questions or leaving questions blank can always occur, so I calculated separate minimum income levels excluding such responses to minimize inaccuracies. Some students might have responded with zero for some of their needs like housing or food if they receive these needed items from someone else, such as their parents. Ideally, it would be best to know the real costs of this valuable support. Even though we do not know what the real costs amount to, we know that they are not zero, so a minimum income level was calculated excluding zeros.

## Results

I applied my methods from the previous section to the data that I collected from survey respondents. Figure 1 shows the averages calculated using responses for each individual category of basic needs. The average monthly amounts that respondents reported spending on each category ranged from as little as \$44 to as much as \$594, with housing, food, and transportation having the highest average spending and clothing the lowest.

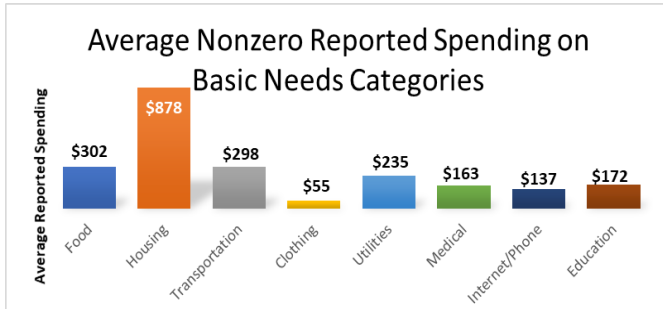


**Figure 1:** This graph shows the calculated average reported spending for each basic needs category included in the survey.

There are some factors which may have biased the data, which I accounted for by calculating multiple minimum income levels. One respondent gave responses



with potentially inaccurate numbers that were extremely skewed to the right (such as paying \$1300 a month for internet and phone service), which may have been a result of them misreading the questions as annual spending rather than monthly. Several other respondents gave an answer of \$0 to several questions on the survey. I calculated separate sets of averages in each category excluding these data to



minimize any potential inaccuracies resulting from their inclusion. The averages for each category excluding these responses appear in Figure 2 below. This yielded only slightly different results in categories such as food, clothing, and internet and phone service, but others, like housing, were greatly changed.

**Figure 2:** This bar graph shows the average reported spending of participants on each category excluding one high outlier and any responses of \$0.

| Description  | Annual dollar amount |
|--|----------------------|
| Calculated minimum income level                      | \$21,384             |
| Calculated income level + tuition (\$7,584)          | \$28,968             |
| Income + tuition without outlier                     | \$27,732             |
| Income + tuition without outlier and answers of zero | \$34,464             |

**Table 1:** Calculated Annual Minimum Income Levels

Table 1 shows the different minimum income levels calculated as part of the study. The first number in the table is a minimum income level of \$21,384 for local college students calculated based on the averages in Figure 1. Because this number reflects spending on needs and education without tuition factored in, I added undergraduate tuition for the 2020-2021 academic year at California State University, Stanislaus to my calculated minimum income level. This yielded an annual minimum income level of \$28,968 for local college students, which is shown in the second row of Table 1.

As was mentioned previously, a separate set of averages excluding one outlier response in the data was also calculated. I then added the 2020-2021 undergraduate tuition to the sum of these averages, resulting in the third number in the table, \$27,732. Row 4 of the table reflects the minimum income level calculated after removing the outlier response and responses of zero dollars to any question on the survey. Creating an annual minimum income level using the averages from Figure 2 and adding in the undergraduate tuition of \$7,584 produces the highest calculated minimum income level in the table, \$34,464.

## Discussion

To put my results into context, I will compare my calculated minimum income levels to each other and to both the official U.S. poverty threshold for single-person households in 2020 and the cost of attendance figures for the 2020-2021 academic year at California State University, Stanislaus.

I decided to look at the official U.S. poverty threshold for single-person households because it is the closest official approximation of the income required by individual college students that can be compared to my calculated minimum income levels. For 2020, this figure was \$13,465 (U.S. Census Bureau, 2021). As was expected, all of my calculated minimum income levels (with or without tuition factored in) are higher than this official measure of poverty. This is probably the case because my survey takes more relevant factors into account (eight categories of basic needs rather than just three times a minimum food budget). Even looking at my lowest calculated minimum income level, \$21,384 without adjustments or tuition factored in, there is a clear difference between the two figures, which could suggest that my poverty definition better reflects the situation of CSU Stanislaus students that face specific needs and prices different from the average individual American.

I also compared my results to CSU Stanislaus's official cost of attendance figures for the current academic year because those figures, although not issued as an official government poverty line, are perhaps a better approximation of the minimum income necessary for students to attend the college than the official poverty threshold is. These numbers reflect average prices in Stanislaus County (where the school is located) and a few specific college-related expenses such as tuition, books, and transportation that are not covered by the official poverty threshold.

Depending on a student's living situation, their estimated cost of attendance ranges from \$18,844 to \$26,130. A student living with their parents is estimated to need a minimum of \$18,844 when attending California State University, Stanislaus for the 2020-2021 academic year. If a student lives on-campus, where housing will presumably be more expensive, they will need \$23,620. Finally, \$26,130 is the expected cost of attendance figure for a student living off campus without their parents (CSU Stanislaus, 2020). After adding in undergraduate tuition, each of my minimum income levels (ranging from \$27,732 to \$34,464) exceeded all of the university's cost of attendance figures. Again, my survey takes more factors into account (such as internet, utilities, medical services, and phone service) than these figures and reflects students' actual reported spending, potentially making my calculated minimum income levels a better reflection of students' basic needs.

There are, however, limitations to this study that may have been caused by survey design, sample size, or simply the nature and timing of the research. As mentioned in the methods section, I received 61 responses to my survey. California State University, Stanislaus has over 10,000 students each year, and no matter how random it is, a sample comprising 0.61% of that population, may not be

reflective of the whole.

My survey data also likely reflects impacts from the COVID-19 pandemic, one way or another. Because California State University, Stanislaus switched to remote learning in March 2020 and has continued doing so to this date, expenses such as transportation, utilities, and education are probably different from what they would usually be. For example, a student who is working from home and taking classes remotely might see their transportation expenses go down to almost \$0 because they are no longer driving, but their educational expenses and electricity bills have most likely increased to reflect the purchase of a computer or the increased time spent at home. Because of this, the data that I collected might not reflect the situation of students during more “normal” times.

The data that I collected might not entirely reflect the bare minimum that students need, either. My survey asked questions regarding what students spend each month on their basic needs; it did not ask what they think the minimum that they require would be. For example, if a student has a brand-new car and included their monthly car payment as a transportation expense in the survey, that expenditure does not reflect the minimum like a bus pass or simple gasoline expenses would.

Despite those limitations, my research and its results still highlight the importance of recognizing students’ basic needs expenditures and how they compare to the general population. Residents of California generally spend a higher proportion of their income on housing than individuals in other states, and college students specifically have expenses like tuition that not everyone has to worry about. The difference between the minimum income levels that I calculated highlight this fact. Factoring tuition into a minimum income level adds a necessary expenditure of over \$7,500 dollars. Excluding financial aid and family support brings that total even higher, which is reflected in the final minimum income calculated. Students who fully pay for all of their expenses face a minimum income of \$34,464, over two and a half times the official U.S. poverty threshold for an individual living alone. Poverty is a major issue worldwide, especially among college students, and the current measurements of that problem don’t reflect everyone who is struggling to make ends meet.

### Acknowledgements

I would like to thank Dr. Elaine Peterson from the Economics Department at CSU Stanislaus for all her help developing my project, from creating my survey to analyzing the data and writing this paper. I would also like to thank Dr. Kelvin Jasek-Rysdahl and research librarian Tim Held for their assistance with developing my initial research topic and proposal.

### References

- [1] Bastiaensen, J., Herdt, T., & D’exelle, B. (2005). Poverty reduction as a local institutional process. *World Development*, 33(6), 979-993. <https://doi.org/10.1016/j.worlddev.2004.09.019>
- [2] Baxter, J. L., & Moosa, I. A. (1996). The consumption function: a basic needs hypothesis. *Journal of*

*Economic Behavior and Organization*, 31(1), 85–100. [https://doi.org/10.1016/S0167-2681\(96\)00866-9](https://doi.org/10.1016/S0167-2681(96)00866-9)

- [3] CSU Stanislaus. (2020). *Cost of attendance*. Retrieved April 11, 2021, from <https://www.csustan.edu/financial-aid-scholarship/financial-aid-basics/cost-attendance>
- [4] Goldrick-Rab, S. (2018). Addressing community college completion rates by securing students’ basic needs. *New Directions for Community Colleges*, 2018(184), 7-16. <https://doi.org/10.1002/cc.20323>
- [5] United States Census Bureau. (2017, September). *Measuring America: How the U.S. Census Bureau measures poverty*. [https://www.census.gov/library/visualizations/2017/demo/poverty\\_measure-how.html](https://www.census.gov/library/visualizations/2017/demo/poverty_measure-how.html)
- [6] United States Census Bureau. (2021, February 2). *Poverty thresholds*. <https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-thresholds.html>

# The Role of Trust and Rapport in Teaching

Malika Shoker

*B.A. Candidate, Department of English, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

Received 16 April 2021; accepted 20 July 2021

---

## Abstract

Within the classroom, the establishment of trust between both students and teachers is dependent on many different elements. More often than not, a student's insecurities surrounding the fear of seeming unintelligent, impedes their learning experience. Because of this issue, trust is needed in order for actual active learning and development to occur. Through naturalistic observation, the relationships between students and teachers in the classroom were noted and analyzed using a specific set of parameters in order to come to a conclusion on the manifestation of trust and rapport. The expectation is that teachers who utilize their skills of emotional intelligence and implement teaching strategies that put an emphasis on the building of trust and rapport, create positive learning atmospheres where students are engaged.

*Keywords: trust, rapport, emotional intelligence, learning experience, classroom environment, teaching strategies*

---

## Introduction

Trust is inherent to teaching. Due to student anxiety, trust in the classroom remains a relevant and multifaceted topic. The question of how teachers facilitate trust and rapport in the classroom to stimulate learning. The implementation of tailored teaching methods, establishment of effective classroom management and emphasis on emotional intelligence all are ways in which trust can actually be developed further in spite of the obstacles present.

Buskist & Saville (2001) in their article explores the definition of rapport, the medium through which trust is built and maintained. The extent to which students believe in a teacher's capability to follow through with their class goals, the student's ability to work towards accomplishing said goals, the teacher's ability to show that they genuinely care for their students' learning and well-being, and the connection between students and teachers as they become motivated in actively learning are all facets of rapport, making it not only a process but an outcome that is achieved after the necessary conditions have been met (Buskist & Saville 2001). The way in which teachers create identities for themselves and how they relate and convey subject matter to students plays a role in their defining of themselves and their classroom atmosphere. Vulnerability is a prominent factor in the formation of rapport, as it bridges the gap between students and teachers. From vulnerability comes the establishment of a learning environment that is conducive to effective teaching (Buskist & Saville 2001). Other factors included: taking a genuine interest in students, knowing their names, sharing personal stories with the class, finding ways to make content relevant to students, and having the empathy to realize and accommodate for students that have problems that inadvertently affect their learning experience (Buskist & Saville 2001).

In a similar study by Webb & Barrett (2014), behaviors exhibited by teachers that facilitated the development of trust included knowing students' names, having enthusiasm for their job, responding to emails in a timely manner, having availability to meet outside of class,

and having a positive attitude in combination with a down to earth nature. As a result of both studies, it can be seen that rapport is able to not only build trust, but facilitate student motivation and interest in learning, as well as student receptiveness to the content being taught.

Lim, Tang, & Tan (2012) conducted a qualitative, observational study using video recorded lesson observations, interviews with teachers about teaching style, and interviews with students. The analysis of the data implied that teachers recognizing unspoken social cues, acting like a friend, outwardly showing concern, understanding cultural backgrounds of students, and practicing patience, all contributed to the effective function of rapport in the classroom (Lim, Tang, & Tan 2012).

Similarly, the study by Loughrin, Berry & Tudbull (2003) indicated that classroom awareness and versatility in teaching styles allows teachers to become more responsive to the needs of their students, reiterating the idea of the learning process being more than knowing and teaching being more than telling. The relationship between teachers and students becomes symbiotic as one feeds off of the energies and efforts from the other, resulting in a collaborative effort when it comes to maintaining trust and respect.

Gurland & Grosnick (2003) explains in their study that the power hierarchy between children and adults implicitly affects the level of trust present and is a factor to be cognizant enough, creating an inherent gap in both the relationship and the level of trust present. The study implies overall that expectancy effects play a role in children's perception of adults and the rapport that is built afterward. Children's expectancies were significantly correlated with their perception of the adult's communicative style, whether or not it was accurate to reality. The children's expectancies and perceptions biased their judgements of whether or not they can establish a strong rapport with said adult.

In terms of teaching, as explained by Corrigan & Chapman (2008), the interpersonal relationship between teachers and students indicates that regardless of power structures, trust and mutual respect provide a viable baseline

for bridging the gap.

Likewise in a more applicable and specific context, Bruney (2012) elaborates on various subtopics related to the development of rapport between students and teachers, focusing on the effect of being the authority figure on student performance, teacher authenticity in relation to students, building self confidence in the classroom, and the establishment of mutual respect in the symbiotic relationship. Common themes were found and analyzed, noting the effective practices of teaching with trust and how they supported student engagement. Teacher authenticity, believing in students, self-perception of both students and teachers, the impact of the teacher persona, and the effect of consistency in teaching were all significant factors in the establishment of trust (Bruney 2012). Rule formation, technical teaching prowess, active involvement of both teachers and students, as well as effort put into rapport building yielded cooperative students who were eager to learn (Stanard 1986).

Gregory & Ripsky (2010) also mention the effects of trust on encouraging and maintaining student commitment to “the rules, norms, and tasks of the classroom”, revealing it to be intrinsic to classroom management. Alongside this, is the idea that the emotional undercurrent of teaching is significant in aiding classroom management, the student-teacher rapport and the facilitation of learning, as there is a “statistically significant positive relationship [that] exists between emotional intelligence and secondary school teachers” (Naqvi, Iqbal, Muhammad, Akhtar, & Naeem 2016). The implications of the study are interesting to note, especially when considering other outside factors such as the teacher’s role as a leader and guide, and teacher stress as well as the classroom management aspect of teaching (Naqvi, Iqbal, Muhammad, Akhtar, & Naeem 2016). The importance of emotional intelligence in teaching styles is also recognized.

The culmination of the variety of sources all led to the foundation for the given research on the development of trust and rapport in the classroom. The link between power structures and their effect on rapport was defined in a broader sense by Gurland and Grosnick (2003), while Corrigan & Chapman (2008) defined trust as an effective start to bridging the hierarchal gap between teachers and students. Bruney’s (2012) findings on emotional intelligence and fostering trust in the classroom served as another cornerstone to my proposed research as it specifically defined rapport and trust within the context of a classroom setting, as well as hinted at certain elements that would aid the symbiotic relationship between student and teacher. Buskist & Saville (2001) defines how to establish rapport and reveals the importance of it in the classroom when contributing to student engagement, interest, receptiveness, and the facilitation of trust, something that is reinforced by Webb & Barrett’s study (2014). In the same vein, Lim, Tang, & Tan (2012) outlined the various elements of teaching style that foster the connection between students and teachers, referencing aspects of teacher reliability found in Loughrin, Berry & Tudbull’s study (2003). Stanard (1986) gave more specific examples of maintaining order and trust within the structures associated with classroom management, as did Gregory &

Ripsky (2010). Meanwhile, Naqvi, Iqbal, Muhammad, Akhtar, & Naeem (2016) revealed how emotional intelligence affects student performance, a characteristic necessary in building both rapport and trust. By synthesizing aspects of each study together and providing new insights as a result of this, the research questions of “How can the teacher facilitate the building of trust and rapport to stimulate learning in the classroom?” and “What is the relationship between teaching style and trust?” can be answered adequately, as the view of the topic of trust and rapport in an academic setting is covered holistically. The following study focused on further defining these elements and how they manifest in classrooms in order to better delineate the effect of the relationship between teaching style and the establishment of trust.

## Methods

The participants of the study included two high school teachers and students from the Massachusetts Department of Secondary and Elementary Education. They were observed via a pre-recorded lecture video found online. Participants did business as normal, as I observed the varying teaching styles between the two teachers and recorded the reactions of students. There were no materials needed for this study aside from a way to record the results found while observing the various classrooms, as well as a laptop in order to view the pre-recorded videos chosen. A simple T-chart for the operationally defined variables and an explanation of each instance where trust, rapport, or emotional intelligence occurs, is what the main note taking consisted of.

Trust can be defined as the number of instances in which a teacher exemplifies aspects of reliability and supportiveness as they contribute to the overall classroom atmosphere being built. This can be seen as the teachers’ own confidence as they teach, indicated by tone of voice or preparedness, and consistency of action, as seen when following through with their words and instructions. Rapport can be defined as the number of times a teacher establishes personal interaction between themselves and the student(s) within a single class period. Telling jokes, using specific/relevant examples aimed towards students in their teaching, and referring to students by their names are all ways rapport is maintained.

After observing the participants, I compiled the notes together and found patterns between the teachers observed, keeping in mind the research question at hand when generating possible theses. Because this was naturalistic observation, the interpretation of the results culminated in the generation of a thesis to explain what happened in the virtual classroom, with the specific examples used to answer the overarching research questions of “how can teachers facilitate the building of trust and rapport to stimulate learning in the classroom?” and “what is the relationship between teaching style and trust?”

## Results

In the experiment the main protease of SARS-CoV-2, shown Trust was divided into subcategories of confidence and consistency, while rapport was divided into instances of jokes, targeted examples, and usage of names

(See Figure 1). Using pie charts to convert the tallying of instances, Teacher 1's teaching style was found to be evenly split between trust and rapport (See Figure 2). However, her rapport was overwhelmingly built by name usage rather than jokes, with 44% outweighing the 6%.

Teacher 2, as depicted by the results, had a different teaching tendency (See Figure 3). With 45% of her style leaning towards trust, the remaining 55% of rapport indicated a heavier reliance on the latter characteristic. 40% of the rapport was created by name usage but unlike Teacher 1, she neglects to use jokes and instead opts for targeted examples, making up the remaining 15%. As a result, Teacher 2 has more of a reliance on rapport building within her teaching style with a 55% majority, whereas Teacher 1 equally uses trust and rapport with a 50% split between both characteristics.

## Discussion

Although Teacher 1 was evenly split between trust and rapport occurrences within her teaching style, she was able to create a classroom atmosphere that was conducive to motivating students. There was more receptiveness and focus given to the content being taught, unlike Teacher 2. Because Teacher 2 utilized rapport more than trust, she created a learning environment that was more personal and involved with students, modeling emotional intelligence. Both teachers exemplified various sub-characteristics of trust and rapport within their individual teaching styles, reiterating how the establishment of them in the classroom go hand in hand.

This is significant because the effect of trust is many times glossed over when thinking of leading a classroom as a teacher, despite the fact that it plays a factor in student performance and the overall positive learning experience for both students and teachers alike. The relationship between the teachers and students are established by rapport and strengthened by trust, the appearance of said concepts varying between different teachers, classrooms, learning experiences, and students. Emotional intelligence plays a role within trust and rapport, as being emotionally conscious of students and their behaviors allow for teachers to adequately react and adapt to the classroom climate.

### Trust + Rapport Variables Key

- Confidence (T)
- Consistency (T)
- Jokes (R)
- Targeted Examples (R)
- Names (R)

Figure 1

A limitation presented in the study centers on the inability to observe a live situation and account for direct student reactions. Another limitation of the research is the inability to interact with the teacher and further assess their reactions to situations and opinions/insight about their own classroom management skills. However, with the focus solely concentrated on teaching style, the study is able to add breadth to the discipline overall in this specific area and contribute to creating solutions to the problem at hand from

a teacher perspective. The analysis of trust and rapport's influence on one another gives the study a holistic view of their collaborative relationship.

Figure 2

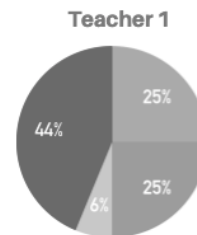
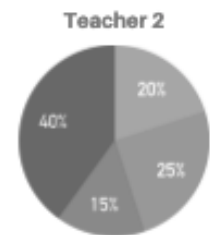


Figure 3



The study takes into account the power hierarchy that determines the level of trust able to be achieved between teachers and students, the effect of the teacher as an authority figure on trust, the establishment of mutual respect and self confidence in the classroom, the effect of rule formation and technical teaching prowess, teacher mindfulness, rapport's effect on student interest and receptiveness to teaching, and simply how to build rapport. By synthesizing the significance of these points and deriving the study's focus from them, it allows for an insightful view of the research topic that previous studies have neglected to explore.

Some further routes for the same vein of study would be to go back and observe live teaching settings in order to cater to some of the unknown variables associated. I also would recommend allowing students and teachers to provide feedback on the lesson observed in order to gain perspective from both sides, as it is again, a symbiotic relationship.

## Acknowledgements

Thank you to the Honors Program at CSU Stanislaus for allowing me the opportunity to make my study to come to life. Thank you to my faculty mentor, Dr. Jori Lindley for your guidance and advice. Thank you to Dr. Suditi Gupta and Dr. Jamila Newton for the continued supervision and support during the process.

## References

- [1] Buskist, B., & Saville, B. (2001, March). Rapport-Building: Creating Positive Emotional Contexts for Enhancing Teaching and Learning. Retrieved April 15, 2020, from [https://www.psychologicalscience.org/teaching/tips/tips\\_0301.html](https://www.psychologicalscience.org/teaching/tips/tips_0301.html)
- [2] Bruney, G. (2013, March 13). The Teacher-Student Relationship: The Importance of Developing Trust and Fostering Emotional Intelligence in the Classroom. Retrieved March 1, 2020, from <https://tspace.library.utoronto.ca/handle/1807/35096>
- [3] Corrigan, M. W., & Chapman, P. E. (2008). Radical Pedagogy. Retrieved May 10, 2020, from [http://radicalpedagogy.icaap.org/content/issue9\\_2/](http://radicalpedagogy.icaap.org/content/issue9_2/)

- [4] Gregory, Anne & Ripski, Michael. (2010). Adolescent trust in teachers: Implications for behavior in the high school classroom. *School Psychology Review*. 37.
- [5] Gurland, S., & Grolnick, W. (2003). Children's Expectancies and Perceptions of Adults: Effects on Rapport. *Child Development*, 74(4), 1212-1224. Retrieved March 1, 2020, from [www.jstor.org/stable/3696218](http://www.jstor.org/stable/3696218)
- [6] Lim, C. S., Tang, K. N., & Tan, S. F. (2012, January 3). Building Rapport with Pupils to Enhance Teaching: Implications from Observing Three Primary Excellent Teachers. Retrieved April 15, 2020, from [http://www.pertanika.upm.edu.my/Pertanika PAPERS/JSSH Vol. 21 \(3\) Sep. 2013/15 Page 1093-1106.pdf](http://www.pertanika.upm.edu.my/Pertanika_PAPERS/JSSH_Vol.21(3)Sep.2013/15Page1093-1106.pdf)
- [7] Loughran, J., Berry, A., & Tudball, E. (2003, March 31). Developing Trust in Teaching: Learning To Help Student-Teachers Learn about Their Practice. Retrieved May 10, 2020, from <https://eric.ed.gov/?id=ED477808>
- [8] Naqvi, H., Iqbal, I., Muhammad Akhtar, & Naeem, S. (2015, November 30). The Relationship between Emotional Intelligence and Performance of Secondary School Teachers. Retrieved March 1, 2020, from <https://eric.ed.gov/?id=EJ1210379>
- [9] Stanard, M. (1986). The Smoothly Functioning Classroom. *Educational Horizons*, 64(2), 78-79. Retrieved March 1, 2020, from [https://www.jstor.org/stable/42925878?read-now=1&refreqid=excelsior%3Acd0ec8d964c2ba813de904fa45c973c4&seq=2#page\\_scan\\_tab\\_contents](https://www.jstor.org/stable/42925878?read-now=1&refreqid=excelsior%3Acd0ec8d964c2ba813de904fa45c973c4&seq=2#page_scan_tab_contents)
- [10] Webb, N. G., & Barrett, L. O. (2014, May). Student views of instructor-student rapport in the college classroom. Retrieved from <https://scholarworks.iu.edu/journals/index.php/josotl/article/view/4259/19210>

# The Significance of the Dark Figure of Crime: Analyzing Unreported Violent Crime Statistics

Yesenia Esmeralda Solorzano

*B.A. Candidate, Department of Criminal Justice, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

Received 16 April 2021; accepted 20 July 2021

---

## Abstract

The underreporting of violent crime is a serious issue in the U.S. that has a great impact on society and the criminal justice system. Since crime statistics are used by different organizations when creating plans for services, services such as police training, police officer allocation and allocation of victim services can be impacted by inaccurate crime statistics caused by underreporting. Therefore, it is important to discover factors that contribute to unreported violent crime and the extent to which violent crime is not reported in the United States. The National Crime Victimization Survey gathers data of unreported crime from households while the Uniform Crime Report gathers data of reported crime from law enforcement agencies. A comparison of these reports shows that there is a great discrepancy between the rates of reported and unreported violent crime. Examination of peer-reviewed studies show the different factors that contribute to unreported crime. These factors primarily consist of the victim's perception of the crime and the justice system, as well as other factors such as reporting the crime to another authority.

---

## Introduction

Statistical data of crime reports are an important tool used by the criminal justice system to analyze crime trends and allocate resources to where they are deemed to be necessary. However, crime statistics that describe how often and what types of crime occur are not completely accurate because many crimes are unreported to law enforcement. According to the Bureau of Justice Statistics, "...nearly 3.4 million violent victimizations per year, went unreported to the police between 2006 and 2010" (BOJS, 2012). Many crimes are unreported each year and so these crime statistics cannot be accepted as the full reality of the number of crimes that are occurring in the nation.

There are many different reasons why victims or crime do not report the crime to the police. These reasons include the fear of secondary victimization by the justice system, the victim's perception of the seriousness of the crime, and the victim's relationship to the offender (Fohring, 2014). Therefore, victims weigh the costs and benefits of reporting crime before they make the decision of whether or not to report. Other reasons for not reporting a crime are due to lack of information about reporting and personal safety. Some victims may be unaware of the resources available to them to help guide them through the process of reporting. Victim's may also fear retaliation from the offender if they do report them to the police.

Unreported crime leads to many different consequences. Underreporting of crime means that victims may not receive the resources they need, and law enforcement do not have any information about the offender and cannot investigate further. Other consequences include limiting the deterrence capability of the criminal justice system, misallocation of police resources, victim's ineligibility for victim services, and forming the role of police in society (Skogan, 1977). Inaccurate crime data can have a negative effect on the justice system and in society, so the factors that prevent people from reporting crimes must be analyzed in order to try to increase reporting. Therefore, it is important to analyze what type of crimes are

not reported and why they are not reported.

## Background

Although many crimes are not reported, they are still accounted for by the National Crime Victimization Survey (NCVS) conducted by the Bureau of Justice Statistics. According to the NCVS, "Nearly 3.4 million violent crimes per year went unreported to police from 2006 to 2010" (NCVS, 2012). Violent crime is less likely to be reported than property crime and serious violent crime, such as rape and aggravated assault, is least likely to be reported. Throughout these years the most common reason why crimes were unreported was, "the fear of retaliation or of getting the offender in trouble" (NCVS, 2012). Another factor that affected whether or not a victim reported a crime was their relationship to the offender. If the victim knew the offender, the crime was less likely to be reported (NCVS, 2012).

Reporting of crimes also varies on the type of crime. More arrests are made for disorderly conduct and other incidents that are perceived as more serious than for larceny-theft and public policy crimes. Americans have a bias to reporting crime by "the man in the street", but offenders are from all social classes and occupations. (Shulman, 1967). The tendency of victims to only report certain types of crimes leads to skewed statistical data which causes a focus on specific social classes and disadvantages as a cause of crime.

The reason victims do not report crimes is not straightforward since victims of crime do not report due to different complex reasons. One of those reasons is to maintain ownership of the incident since the conflict is then controlled by the justice system and the victim's role is diminished. Other reasons include being victimized by the police and the victim's perceptions of the crime, law enforcement, and the stigma of being labeled a victim. These reasons are especially important in sensitive cases, such as rape, where the victim already feels helpless. Out of all these reasons, "...the strongest predictor of reporting was the

victim's perception of the incident" (Fohring, 2015). The victim's view of whether or not the incident they experienced had serious impacts on whether or not the victim reports it to law enforcement.

People's attitudes toward police are a great determinant of whether or not a crime will be reported. People are more likely to report crimes if, "they are more integrated into the community, if they believe the police will be able to catch the offender, if they are more trusting of the police, and if they have been involved in neighborhood-based crime prevention..." (Schneider, et al., 1975). Therefore, efforts that improve attitudes towards the justice system, such as apprehension of criminals, locating stolen property, and punishing offenders, should be implemented to increase the rate of reporting. It is also important to design programs that increase citizen involvement in the community since alienation from the community reduces the likelihood of reporting crimes.

Unreported crimes can lead to many problems in society such as: limiting the criminal justice system's ability to stop crime, misallocation of police resources, victim's ineligibility for victim services, affecting insurance costs, and altering the role of law enforcement in a community. Another social problem that can happen due to unreported crime is that "inferences based on arrest data unduly skew the distribution of criminality in the direction of minorities and the poor" (Skogan, 1977). Some types of crime are often reported, such as homicide and auto theft, while crimes that do not result in death or a great property loss are not consistently reported.

Police resources such as police surveillance in cities and police training are dependent on crime data statistics. Areas that are deemed to be in greater need of police presence and areas that need police officers who are trained in specialized areas are determined by crime rates. It is also important to be aware that although many crimes are reported, there is also a great number of crimes that are not reported. Further studies into unreported crime can assist in providing more information as to why crimes are not reported and methods that can be used in an attempt to increase the rate of reporting.

## Methods

This explanatory research uses data from both reported crime statistics and unreported crime data. Explanatory research is conducted to explain aspects of my study in a more detailed manner. It also uses information from psychological studies to analyze unreported crime factors. Comparisons are made of data and information across several years, 2000-2018, in order to provide a clear analysis of change in data over time. The research is conducted by examining data of reported violent crime from the UCR and both reported and unreported crime from the NCVS. The data spans from the years 2000-2018 and is compared to each other in order to determine any differences between the rate of reporting from the two sources. The general rate of victimizations was derived from each of the two reports. The rate of victimizations per 1,000 persons was also derived from these two sources in order to determine any frequency of crime for individuals. The study will also discuss different reasons why crimes are

underreported, which are derived from peer-reviewed journals and the NCVS report.

## Results

I analyzed data of violent victimizations from both the NCVS and the UCR in order to make comparisons over an 18-year time period, 2000-2018 (See Table 1 in Appendix A). According to the NCVS, the rate of violent victimizations has increased from 4.3 million to 6.3 million from the years 2000 to 2018. The increase in crime has not been consistent, then crime seemed to decrease up to the year 2005, where it spiked an increase. From 2006 the crime rate decreased until the year 2012 where the crime rate spiked again (See Figure 1). The rate of victimizations per 1,000 persons has also fluctuated throughout these years, from 21.1 in 2005, to 26.1 in 2012, to 23.2 in 2018 (See Table 1 in Appendix A). The results from the UCR show that rates of violent victimization have gradually decreased from 1.4 million to 1.2 million from the years 2000-2018 (See Table 2 in Appendix B). The rate of crime has decreased slightly, but consistently throughout the 18-year time period. The rate of victimizations per 1,000 persons has also gradually decreased from 5.1 to 3.7 from the years 2000 to 2018 (See Figure 1).

The NCVS and the UCR have some differences in how data is collected. The NCVS does not collect data of murder and nonnegligent manslaughter, but it does include all data of sexual assault. (FBI: UCR, 2013). The UCR includes data of murder, non-negligent manslaughter, and commercial crimes, but only includes arrest data for sexual assault (FBI: UCR, 2013).

When analyzing the reasons why victims did not report crimes to the police, the major factors are due to psychological reasons. These factors include reporting the crime to another official that is not a part of law enforcement, the victim believing that their victimization is not important enough to report, the victim believing that the police would not or could not help them, and the victim attempting to protect the offender or fearing retaliation from the offender. Figure 2 represents the factors that affect the reporting of crimes as gathered from the NCVS. According to Figure 2, 35% of victims reported the crime to another official, 18% did not believe their victimization was important enough, 16% believed that the police would not or could not help, 13% wanted to protect the offender or feared retaliation, and 18% did not answer. Therefore, the major factors that contributed to underreporting of crime were due to psychological factors.



Figure 1. This line graph represents the rates of violent victimizations per 1,000 persons from both the NCVS and the UCR.

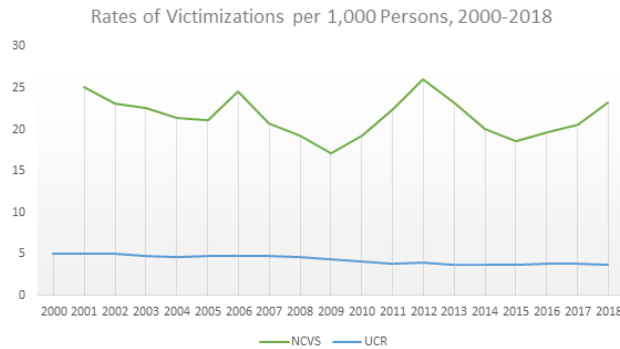
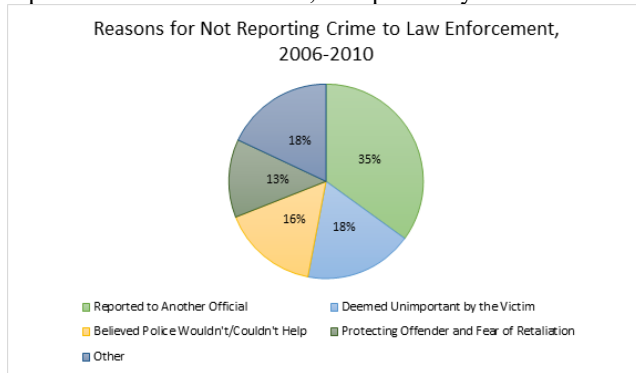


Figure 2. This pie chart represents the composition of different reasonings why violent victimizations were not reported to law enforcement, as reported by the NCVS.



## Discussion

The results from this study show that there is a great discrepancy between the nation's largest databases for crime recording. The NCVS shows that there is a greater number of violent victimizations compared to the crime rates in the UCR's reported data. Also, the NCVS shows that the rate of violent victimizations has fluctuated irregularly throughout the years. This means The UCR shows that rates of violent victimizations have steadily decreased throughout the 18-year time period. The purpose of this study is to analyze and compare reported and unreported crime rates in order to determine the difference between them. I analyzed data from the years 2000 to 2018 from both the NCVS and the UCR, the country's two main crime data reports. From this analysis, I was able to draw the conclusion that violent crimes in the U.S. are largely unreported. The data from the UCR indicates that violent crime has been decreasing from the years 2000 to 2018. The NCVS indicates that violent crime has been increasing throughout the same span of time, this is possibly due to an overall increase in population. Although both the population of the U.S. and the rates of violent crime has increased since the year 2000, the rate of crime reporting has stayed roughly the same; approximately half of crimes are not reported to the police. The NCVS shows that the rate of victimizations per 1,000 persons has fluctuated through 2000 to 2018, meaning that the prevalence at which people have experienced crime has constantly changed. This may also be due to changes in

overall population and it is important because it shows how likely people are to experience a crime. So even though the likelihood of experiencing a crime has changed, the rate of unreported crime has still been substantial throughout this timespan.

The reasons victims stated they did not report a crime from the NCVS were consistent with those of Fohring (2015). The reason most commonly given to explain not reporting to the police is that the victim had already reported the crime to another official, such as a manager or a school official. The other reasons include: the crime not being important enough for the victim to report, the belief that the police would not or could not help, and the victims' fear that they would face retaliation from the offender or wanting to protect the offender. This data has remained consistent from the years 2006-2010.

Research about unreported crime may continue by conducting close analysis of the reasons contributing to unreported crime. This can lead to a more thorough explanation of each different factor. A better understanding of each factor can help establish different methods to attempt to increase the rate of reporting. Future studies can also be conducted to determine whether an increase in crime reporting causes a decrease in crimes. With a higher likelihood of being reported, crime rates may possibly reduce over time.

## References

- [1] Langton, L., Berzofsky, M., C., & Smiley-McDonald, H. (2012, August). *Victimizations Not Reported to the Police, 2006-2010*.
- [2] Schneider, A. L., Burcart, J., & Wilson, L. A. (1975). *The Role of Attitudes in Decisions to Report Crimes to the Police*.
- [3] Shulman, H. M. (1967). *Measurement of Crime in the United States*. *Journal of Criminal Law and Criminology*, 57(4), 7th ser.
- [4] Skogan, W. G. (1977). *Dimensions of the Dark Figure of Unreported Crime*.
- [5] FBI: UCR. Table 1: *Crime in the United States by Volume and Rate per 100,000 Inhabitants, 1999-2018*. (2019, September 17).
- [6] Morgan, R. E., & Oudekerk, B. A. (2019). *Criminal Victimization, 2018*. *National Crime Victimization Survey*. [Washington, D.C.]: Bureau of Justice Statistics.
- [7] Morgan, R. E., & Truman, J. L. (2018). *Criminal Victimization, 2017*. *National Crime Victimization Survey*. [Washington, D.C.]: Bureau of Justice Statistics.

- [8] Morgan, R. E., & Kena, G. (2018). Criminal Victimization, 2016. National Crime Victimization Survey. [Washington, D.C.]: Bureau of Justice Statistics.
- [9] Morgan, R. E., & Truman, J. L. (2016). Criminal Victimization, 2015. National Crime Victimization Survey. [Washington, D.C.]: Bureau of Justice Statistics.
- [10] Truman, J.L., & Langton, L. (2015). Criminal Victimization, 2014. National Crime Victimization Survey. [Washington, D.C.]: Bureau of Justice Statistics.
- [11] Truman, J.L., & Langton, L. (2014). Criminal Victimization, 2013. National Crime Victimization Survey. [Washington, D.C.]: Bureau of Justice Statistics.
- [12] Truman, J.L., & Langton, L., & Planty, M. (2013). Criminal Victimization, 2012. National Crime Victimization Survey. [Washington, D.C.]: Bureau of Justice Statistics.
- [13] Truman, J.L., & Planty, M. (2012). Criminal Victimization, 2011. National Crime Victimization Survey. [Washington, D.C.]: Bureau of Justice Statistics.
- [14] Truman, J.L. (2011). Criminal Victimization, 2010. National Crime Victimization Survey. [Washington, D.C.]: Bureau of Justice Statistics.
- [15] Truman, J.L., & Rand, M.R. (2010). Criminal Victimization, 2009. National Crime Victimization Survey. [Washington, D.C.]: Bureau of Justice Statistics.
- [16] Rand, M.R. (2009). Criminal Victimization, 2008. National Crime Victimization Survey. [Washington, D.C.]: Bureau of Justice Statistics.
- [17] Rand, M.R. (2008). Criminal Victimization, 2007. National Crime Victimization Survey. [Washington, D.C.]: Bureau of Justice Statistics.
- [18] Rand, M.R., & Catalano, S.M. (2007). Criminal Victimization, 2006. National Crime Victimization Survey. [Washington, D.C.]: Bureau of Justice Statistics.
- [19] Catalano, S.M. (2006). Criminal Victimization, 2005. National Crime Victimization Survey. [Washington, D.C.]: Bureau of Justice Statistics.
- [20] Catalano, S.M. (2005). Criminal Victimization, 2004. National Crime Victimization Survey. [Washington, D.C.]: Bureau of Justice Statistics.
- [21] Catalano, S.M. (2006). Criminal Victimization, 2005. National Crime Victimization Survey. [Washington, D.C.]: Bureau of Justice Statistics.
- [22] Catalano, S.M. (2005). Criminal Victimization, 2004. National Crime Victimization Survey. [Washington, D.C.]: Bureau of Justice Statistics.
- [23] Catalano, S.M. (2004). Criminal Victimization, 2003. National Crime Victimization Survey. [Washington, D.C.]: Bureau of Justice Statistics.
- [24] Greenfield, L.A. (2003). Criminal Victimization, 2002. National Crime Victimization Survey. [Washington, D.C.]: Bureau of Justice Statistics.
- [25] Renninson, C.M. (2002). Criminal Victimization, 2001. National Crime Victimization Survey. [Washington, D.C.]: Bureau of Justice Statistics.
- [26] Renninson, C.M. (2001). Criminal Victimization, 2000. National Crime Victimization Survey. [Washington, D.C.]: Bureau of Justice Statistics.

# Forensic Anthropology in Latin America: Examining Methods of Human Identification

Catarina M. Sousa

*INSERT B.A. Candidate, Department of Criminology, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

*Received 16 April 2021; accepted 20 July 2021*

---

## Abstract

For countless individual's social media networking platforms are just fragments of their daily lives, and for others it is an absolutely essential part of it. As so, it is vital to explore the effects stemming from consumption. This research intended to identify the types of negative emotional effects observed in users of virtual networking platforms (VNP), specifically the platform Instagram. Additionally, research explored if emotional effects varied in regard to age and gender. In particular, we expected to see females ages 18-24 reporting negative emotional effects in greater instances when compared to females 24-30, males 18-24,25-30. A self-report survey was administered examining emotional effects of Instagram measuring use and intensity. Responses were taken into account to conclude that participants were either: Highly emotionally attached, passive user 2. Highly emotional attached, active user 3. Low emotional attachment, passive user 4. Low emotional attachment, active user. After analyzing the data, it was concluded that females of both age groups demonstrated a low emotional attachment to Instagram. When examining use females ages 18-24 were shown to be passive users, while females ages 25-30 were active users. To conclude females 18-24 low attachment, passive user; females 25-30 low attachment, active user. These results indicate that when it comes to emotional attachment to Instagram in females that age is not a significant factor. At least, when comparing females between the ages of 18-30.

---

## Introduction

Over the years mass media has transformed and evolved to become an amazing virtual community full of possibilities. What was then radio, newspapers, and magazines has now become online social media platforms. Social media can be described as internet-based networking platforms that connect individuals through online communities. A few examples popular in America's society would be platforms such as Facebook, Snapchat, Instagram, and YouTube. As they have increased in popularity researchers have begun to research their effects. It has been argued that social media may have a vast variety of both positive and negative effects {on business, education, society etc.}, and that it is difficult to conclude which one is more overpowering than the other (Akram and Kumar, 2017).

For many individuals, social media networking platforms are just another part of their daily lives, and for others it is absolutely a necessary part of it. As consumers, it is important to acknowledge the variety of effects that stem from the use of virtual networking platforms (VNP). Furthermore, this research intended to identify the types of negative emotional effects observed in users of VNP, specifically Instagram. Additionally, this research questioned if emotional effects vary in regard to age and gender. In narrowing the focus to negative emotional effects that stem from online social media we as consumers can counteract these effects to improve our mental and emotional well-being.

This study will have critically addressed past research that suggests a wide variety of emotional effects both positive and negative, stemming from the use of online social media platforms, and will contribute to this literature by examining the negative emotional effects of Instagram use. In order to do so, a survey was designed to collect primary data in regard to emotional effects stemming from Instagram use. This study hypothesized that individuals would report a majority of negative emotional effects stemming from consumption of the VNP Instagram. Specifically, we expected to see females ages 18-24 reporting negative emotional effects in greater instances when compared to females (24-30), males (18-24), and males (25-30). This is in part due to past research findings that show an increase in the VNP Instagram's popularity. In particular, it was found that 75% of individuals aged 18-29 visited these platforms daily (Perrin & Anderson, 2019). Furthermore, 18-24-year old's (75%) are much more probable to use Instagram than persons aged 25-30 (57%) (Perrin & Anderson, 2019).

## Background

What is social media exactly? It is most commonly regarded as virtual networking platforms (VNP) that connect individuals through online communities. For the year 2019 the top three most widely used VNP included YouTube, Instagram, and Snapchat (Perrin & Anderson, 2019). A few of the most common purposes for these social media outlets

include entertainment, information, and education. Along with the sharing of information online communities serve as public forums for the examination of significant topics and ideas (Open L, 2016).

As technology has advanced over the years, the ease of access to social media has increased as well. In today's society about 96% of Americans own a cell phone of some kind, with 81% owning a smart phone capable of downloading online networking applications. This is a dramatic increase in ownership compared to 35% in the year 2011. (Pew Research Center, 2020) This rise in smartphone ownership has been just one of many factors that led to the increased download of social media platforms and subsequent use of social media. Moreover, the VNP Instagram has increased in popularity, with 75% of individuals aged 18-29 visiting these platforms daily (Perrin & Anderson, 2019). Furthermore, 18-24-year old's (75%) are much more probable to use Instagram than persons aged 25-30. (57%) (Perrin & Anderson, 2019). As accessibility and use increase individuals have begun placing more and more importance on technology. Such an intense focus on social media and online realities can promote unhealthy habits such as reduced human contact, dependence on electronic search engines, and an unhealthy attachment to technology (Akram & Kumar, 2017). Specifically, this study focused on the VNP Instagram, which erupted into the world in 2010. Instagram emerged in 2010, with the use of visual and social interactions to bring people together sharing experiences all over the world (Open L, 2016). Originally launched by Kevin Systrom and then funded by two venture capitalists Ventures and Horowitz Burbn (Blystone, 2020). After some success, the online platform became well known and the brand Instagram was born. Over time the platform has only increased in popularity and use. This study examined possible emotional side effects.

## Methods

In order to determine if negative emotional effects observed in consumers of Instagram vary in regard to age and gender, I administered a survey examining the emotional effects of Instagram based on use and intensity. This survey collected primary data. Participants were required to be within 18 to 30 years of age at the time of the study and have at least one account registered to the virtual networking platform (VNP) Instagram. It is important to note that the term social media or VNP was extended to other applications. For example, those who did not have an Instagram account were re-routed to a short survey about YouTube. At that point if you were not

registered to either platform, the survey ended. This research required a minimum of 75-100 participants. Recruitment used a public post/ advertisement on both the platform Instagram and Facebook. The post was made public so that it could be shared with a wider audience. To attract individuals, a monetary incentive was used. This was one entry per participant into a random drawing of a \$25 Amazon gift card. The questionnaire itself was administered through the online software service Survey Monkey.

The first section determined if the respondent qualified for the required terms, such as having at least one account registered to the VNP Instagram. Other questions focused on demographic information that was kept anonymous such as age, gender, and level of education. The second section focused on an adapted version of the study by Gerson, Plagnol and Corr (2017) Passive and Active Use Measure, this scale uses a 1 (never 0%) - to 5 (very frequently being 100%) scale to quantify responses. Each question is designed to indicate an active or passive Instagram user. There were also questions from the Instagram Intensity scale, based on Ellison et al. (2007) which uses a 1-5 scale to indicate the emotional investment of a user. At the end there was an optional short answer prompt, responses would be developed into a word map to illustrate the most common concepts associated by users regarding their experience with the VNP Instagram.

A small group of 5-10 individuals took the finalized survey in early December. At that time, feedback was requested from peers. Starting January 2021, the survey was made available to the public. A multivariable statistical analysis was conducted based upon the data from the survey. The goal was to understand what explains the prevalence of negative emotional effects among Instagram users. In addition to quantitative data analysis, I had originally planned to develop a word map to illustrate the most common concepts associated by users regarding their experience with the VNP Instagram.

I argued that individuals would report a majority of negative emotional effects stemming from usage of the VNP Instagram. Specifically, I argued that females ages 18-24 will report negative emotional effects in greater instances when compared to females (24-30), males (18-24), and males (25-30). Past research has demonstrated that 75% of individuals ages 18-29 visit social media platforms every day (Perrin & Anderson, 2019), however an outstanding difference is seen in ages 18-24 and 25-30. Furthermore, 18-24-year old's (75%) are much more likely to use the VNP Instagram when compared to individuals aged 25-30 (57%). (Perrin & Anderson,

2019). This past research suggests that individuals ages 18-24 are more likely to use the VNP Instagram.

The Instagram Intensity Scale indicated emotional attachment and integration into participants' lives. A mean score higher than 3.0 indicated an increased probability of emotional attachment/ or investment. A score lower than 2.9 indicated a low emotional attachment. Furthermore, the Passive and Active Use Measure responses determined if the participant was an active user who interacts virtually, or a passive user who views without interacting. The scores from both scales were taken into account to conclude that participants were either: 1. Highly emotionally attached, passive user 2. Highly emotional attached, active user 3. Low emotional attachment, passive user 4. Low emotional attachment, active user. If two or more groups are equally weighted in age and gender, then I would have looked to include level of education as an additional factor in determining which group has the highest reported negative emotional effects. This project would be considered a success if we are able to collect data effectively and come to a conclusion in regard to gender and age. This research acknowledges that data may be skewed slightly as this research is being conducted during the Covid-19 pandemic. I concede that this pandemic has displaced many individuals and perhaps increased the time spent at home. Due to this displacement, some data may be slightly higher than normal if this study were conducted outside of a pandemic time frame.

## Results

As the data collection came to end, it was important to note the number of male respondents compared to the female respondents. There was a total of 20 males, 122 females, and 1 non-binary participants. The number of males and non- binary respondents was so low that a comparison to the female data would not be accurate nor representative. Instead, this study presents results in regard to females and emotional effects stemming from Instagram use. As mentioned previously, the original hypothesis expected females ages 18-24 to demonstrate negative emotional effects in greater instances. In reality, data instead indicated that neither group of females were reporting negative emotional effects. Instead this study suggests that females 18-24 have low emotional attachment and are passive users. While females aged 25-30 have low emotional attachment and are active users.

To clarify once again, the following results are specific to the female's respondents only. After analyzing data, the mean score for attachment and intensity was

calculated. When looking at the ages of the female respondents, we can see clearly in Figure 1 that females ages 18-24 responded to the survey as the majority group. Moving forward, responses from the questionnaire were analyzed to find the mean score for attachment and intensity for both groups, F 18-24 and F 25-30. This is where the study could directly investigate age as a factor, when reporting side effects from Instagram. Questions 28-45 were focused on, as those questions directed the participants to reflect and self-report on attachment and use. Each question was reflected on, finding the most common response by age group. In the end, it was found that females ages 18-24 reported attachment with a mean score of 2.8, while females 25-30 scored extremely similar with a mean score of 2.9. However, when investigating intensity, we can see a slight difference. Females ages 18-24 had a mean score of 2.9, compared to females ages 25-30 scoring at a higher average of 3.2. See figure 2 for a visual display. In the end, this study rejected the original hypothesis. Instead, both groups of females had extremely similar scores for attachment. However, we can see that they differ slightly when we look at Intensity, (which was measured by Instagram use). F 25-30 demonstrated to on average be active users, while F 18-24 remain passive users.

Additionally, none of the respondents who did not have an account registered to Instagram elected to participate in the rerouted YouTube survey. Therefore, no results will be presented in regard to the secondary YouTube survey. Furthermore, responses for the word map were unable to be collected and therefore not presented. Majority of participants reported being confused and unaware of what the question was asking. This was a human error in word choice. In order to correct this error, the next survey would have a very clear definition directly included in the question instead in the section prior to the question.

## Discussion

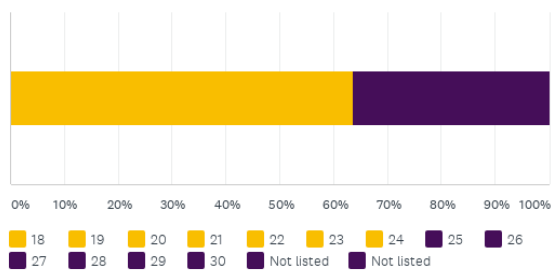
This study found that when analyzing emotional effects stemming from the consumption of the virtual networking platform Instagram, that age does effect intensity. This was measured as either passive or active use. Furthermore, when addressing if gender affected results, we were unable to investigate due to the lack of male respondents. These preliminary findings suggest that as female age increases, it is possible that individuals identify themselves as active users of Instagram. The biggest downfall to this study was the number of male respondents. The number was so low that a comparison to the female data would not have been representative. This study was able to address female data and give some insight on the

differences based upon age. In a future study it would be beneficial to have additional age groups to compare, this would allow for a more in-depth comparison. Considering that virtual networking platforms have grown dramatically over the past decade and continue to do so I expect to see more research investigating the side effects, and even looking into the sociological or psychological explanations.

## Figures

Figure 1

Q7 Please select your age



Yellow- Females aged 18-24

Purple- Females aged 25-30

Over 60% of the female respondents reported their age in the 18-24 category.

Figure 2

|                  | Attachment<br>1(lowest)-<br>5(highest) | Intensity<br>1(passive)-<br>5(active) |
|------------------|--|---------------------------------------|
| Females<br>18-24 | Mean score 2.8                         | Mean score of 2.9                     |
| Females<br>25-30 | Means score of 2.9                     | Mean score of 3.2                     |

This figure visually demonstrates the final results.

Clarification: A mean score higher than 3.0 indicated an increased probability of emotional attachment/ or investment, while a score lower than 2.9 indicated a low emotional attachment. A mean score higher than 3.0 for intensity indicated active user, while a mean score lower than 2.9 indicated a passive user.

## References

- [1] Akram, W., & Kumar, R. (2017). A Study on Positive and Negative Effects of Social Media on Society. *International Journal of Computer Sciences and Engineering*, 5(10), 351–354. doi: 10.26438/ijcse/v5i10.351354
- Blystone, D. (2020, August 29). *The Story of Instagram: The Rise of the # 1 Photo-Sharing Application*. Investopedia. <https://www.investopedia.com/articles/investing/102615/story-instagram-rise-1-photo0sharing-app.asp>.
- [2] Ellison, N. B., Steinfield, C., & Lampe, C. (2007). The benefits of Facebook “friends:” Social capital and college students’ use of online social network sites. *Journal of ComputerMediated Communication*, 12, 1143–1168.
- [3] Gerson, J., Plagnol, A., & Corr, P. J. (2017). Passive and active Facebook use measure (PAUM): validation and relationship to the Reinforcement Sensitivity Theory. *Personality and Individual Differences*, 117, 81-90.
- [4] [Open L]. (2016, March 22). *1.3 The Evolution of Media*. Understanding Media and Culture. <https://open.lib.umn.edu/mediaandculture/chapter/1-3-the-evolution-of-media/>.
- [5] Perrin, A., & Anderson, M. (2019, April 10). Share of U.S. adults using social media, including Facebook, is mostly unchanged since 2018. Retrieved February 27, 2020, from <https://www.pewresearch.org/fact-tank/2019/04/10/share-of-u-s-adults-using-social-media-including-facebook-is-mostly-unchanged-since-2018/>
- [6] Pew Research Center. (2021, April 26). *Demographics of Mobile Device Ownership and Adoption in the United States*. Pew Research Center: Internet, Science & Tech. <https://www.pewresearch.org/internet/factsheet/mobile/#:~:text=The%20vast%20majority%20of%20Americans,smartphone%20ownership%20conducted%20in%202011.>

# Stress from Side Effects Found in Participants on Antipsychotics

Sabrina Stephens

*B.A. Candidate, Department of Psychology, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

Received 16 April 2021; accepted 20 July 2021

---

## Abstract

Antipsychotics are used to control the symptoms of psychosis disorders, but their side effects can be debilitating and stressful. These medications can develop a variety of side effects, and it is common for patients to experience at least one during treatment. Researchers and clinicians primarily focus on the prevalence and appearance of side effects, not their impact. More attention is needed in this area of treatment. Do individuals taking antipsychotics experience more stress when they report having side effects than individuals who do not report having side effects? Do weight-gain related side effects cause more stress than sleep-disturbance related side effects? Current research supports the claim that stress is a byproduct of side effects. Expected results of the study were that group means would show a higher amount of stress in participants with side effects than those without; additionally, weight-gain related side effects would cause more stress than sleep-disturbance related side effects.

*Keywords: Antipsychotic, Stress, Medication, Psychology*

---

## Introduction

Antipsychotics are important medications in psychopharmacology. Antipsychotics are medications used for the treatment of psychosis (disorders such as schizophrenia and bipolar disorder, but antipsychotics can also be used for some non-psychosis related diagnoses). There are two classes: typical/ first generational, and atypical/ second generational. Antipsychotics alter effects of dopamine (primarily), serotonin, noradrenaline, and acetylcholine in the brain to promote wellness and happiness (Ananth et al, 2001). These medications promote behavioral and mood changes. Stroup and Gray list some of the known side effects as: “mild sedation, dry mouth, constipation, akathisia, sexual dysfunction, acute dystonia, weight gain, tardive dyskinesia, myocarditis, and agranulocytosis” (2018). Side effect severity and appearance varies between patients and drug type. Ways in which side effects are managed can be lowering the dose of the prescription, changing the prescribed antipsychotic (this is the most common approach when the amount of or severity of the side effects outweigh the benefits of continuing the prescription), prescribing additional medications that are meant to counter the specific side effects, and (rarely) behavioral techniques (Stroup & Gray, 2018). A challenge with this process is patients still can face side effects during/after medication changes. Antipsychotics are helpful to patients but dealing with side effects presents extra challenges towards treatment.

It is very common for patients to experience some form of side effect(s) while taking an antipsychotic. In a study including twenty adolescents spanning a six-week trial, almost all participants reported experiencing at least one distressing side effect at both measurement periods, week two and week six (Schimmelmann et al., 2005). Another study with a sample of two hundred two participants found that almost all their sample reported

experiencing at least one side effect from their antipsychotic (Fakhoury et al., 2001). Cascade and associates found that fifty-four percent of their three hundred fifty-three participant sample reported experiencing a side effect from their antipsychotic as well (2010). This research supports the claim that there is a high rate of patients experiencing side effects from their antipsychotics. Antipsychotics are a beneficial form of treatment, but when side effects are alarming and cause high rates of stress, they are no longer considered beneficial to the patient (cons outweighing benefits).

Another common trend with antipsychotics is the association between experiencing side effects and high levels of distress. Building on Cascade and associates’ research, their overall sample showed forty-one percent of participants reported their side effects as either very or extremely distressing/ bothersome (2010). Thirty-three percent reported side effects as somewhat distressing, twenty-one percent as slightly distressing, and four percent as not at all distressing. Schimmelmann’s team also reported an association between distress and side effects (2005). It is important to mention that this distress led to negative subjective wellbeing. While Fakhoury’s team focused on the prevalence of side effects in their sample, they also noted there was a “[significant association with reported] weight gain, difficulty thinking/ concentrating, muscle/ joint stiffness and depression as quite or extremely distressing (Fakhoury et al., 2001). High rates of stress from antipsychotics’ side effects are an important issue because it affects patients’ attitude and motivation towards treatment.

Stress can cause havoc on a person’s physical and mental health. According to the American Psychological Association stress can cause things such as muscle tension (which causes other reactions such as tension headaches), respiratory issues, cardiovascular issues, inability to regulate the immune system and inflammation, metabolic

disorders, issues with the gastrointestinal system, and complications in both male and female reproductive systems (2019). Stress can lead to stress disorders, depression, and other mental illnesses. It is also noted that anxiety and decreased sexy drive are responses of stress. It is much more common for women to experience stress symptoms and develop stress disorders as compared to men (U.S Department of Health and Human Services, 2019). Studies have also shown that there is a negative correlation between stress and life expectancy; this trend is especially true in people with mental illnesses (Health Psychology, 2019). This list of outcomes from stress represent a snowball effect that occurs when patients experience stress from side effects. It is important to consider this research when examining the prevalence of side effects for individuals on antipsychotics.

Distress from antipsychotics lead to negative outcomes for patients. A significant association between side effects and distress resulted in participants having a negative wellbeing and lack of devotion to their antipsychotic treatment (Schimmelmann et al., 2005). Participants were also found to be highly dissatisfied with their antipsychotic (Fakhoury et al.,2001). This issue also led to a high rate of nonadherence towards treatment (Fakhoury et al., 2001). Schimmelmann believes that these results occur because clinicians often overlook distress and primarily focus on the side effects themselves (2005). Lambert and associates found similar data in which nonadherence towards treatment was correlated with negative attitudes towards antipsychotics and experiencing side effects from medications (2004). This means that the association between side effects and distress is often ignored and signals an underlying problem with antipsychotic treatment that needs further research and discussion.

The purpose of the present study was to examine differences in stress between those who do and do not have side effects from their antipsychotic. This study was also meant to examine which side effects caused participants the most stress. All participants were asked to complete a demographics questionnaire and a general stress scale. Anyone who indicated they experienced side effects from their antipsychotic were directed to complete an additional side effect questionnaire, side effect stress-scale, and COVID-19 stress-scale. Based on previous research it was hypothesized that participants who indicated they experience side effects from their antipsychotic would report higher stress levels than participants who did not indicate they experience side effects from their antipsychotic. It was also hypothesized that weight-gain related side effects would cause more stress than sleep-disturbance related side effects.

## **Methods**

### *Participants*

Students were recruited through the CSU Stanislaus Department of Psychology online participant pool (SONA). Due to data collection issues, not enough participants qualified for this study to gather information about the sample's demographics. All participants were given 1 SONA credit for participating in the study, which may have counted as experimental credit for a psychology

class.

### *Design*

The research design was a double factor, two-group, between-subjects design, to examine factors pertaining to stress in relationship to side effect presence. The independent variable was if the participant experienced side effects from their antipsychotic. The independent variable had no direct manipulation but was a predetermined participant variable. Participants indicated in the survey if they had any side effects. Participants with side effects were asked what side effects they experienced and received the related stress scales. Participants who did not experience side effects were given the general stress scale. The dependent variable was the stress scale ratings participants gave on the various measures.

### *Measures*

The measures used in the study were a demographics questionnaire, side effect questionnaire, side effect stress-scale, COVID-19 stress-scale, and general stress-scale. The demographics questionnaire consisted of 6 questions designed to assess the participants' personal characteristics and if they were taking an antipsychotic. The side effect questionnaire consisted of 1 question where participants chose from a list which side effects they experienced the worst (participants had a write in option at the bottom of the list if their side effect was not already listed). The side effect stress-scale was a 5-point Likert-scale, with 1 representing "no stress", and 5 representing "an extreme amount of stress". The COVID-19 and general stress-scale used the same 5-point Likert scale with identical values.

### *Procedure*

Participants were recruited through SONA. Those who were interested were able to access further information about the study, the Consent Form, demographics questionnaire, side effect questionnaire, and stress-scales through Qualtrics. Once a participant agreed to participate, they were instructed on how to advance through all portions of each section, beginning with the consent form.

Upon completion of the consent form, the participants were then instructed to complete a demographics questionnaire. Participants were assigned to one of the two conditions based on if they experienced any side effects from their antipsychotic. Any participant who indicated they experienced side effects viewed the side effect questionnaire, side effect stress-scale, and COVID-19 stress scale. All participants viewed the general stress-scale (this was the only other measure the non-side effect group was given).

At the conclusion of the experiment, the participants were then directed to the debriefing sheet, at which time they were thanked for their participation, and the purpose of the study was explained to them. It was clarified to them that the study's purpose was to examine factors pertaining to stress and its relationship to antipsychotic side effects.



## Results

This research was meant to examine differences in stress amongst individuals taking an antipsychotic. Side effect stress variability was also of interest in this study. Due to data collection issues, there are no results currently. This study did not receive enough qualifying participants to meet the needs of either proposed hypotheses. It was hypothesized that participants who were taking an antipsychotic, and indicated they experienced side effects from it, would report higher levels of stress than the participants who were taking an antipsychotic but experienced no side effects. It was also hypothesized that weight-gain related side effects would cause more stress than sleep-disturbance related side effects.

Previous data highly supports these hypotheses, but alternative results could have shown opposite effects between the groups, or even no differences between groups. Alternative results may have also showed sleep-disturbance side effects caused more stress, or a different side effect from the study could have caused the most stress. Future research is needed to confirm the results of this study.

## Discussion/ Future work

Due to data collection issues, the results of the present study did not support the hypothesis that those taking an antipsychotic(s) and experiencing side effects would report higher stress levels than participants on antipsychotics who do not experience side effects. The study's second hypothesis that weight-gain related side effects would cause more stress than sleep-disturbance related side effects was also not supported. These results are consistent with some previous studies (Pies, 2009). It is important to note the similarities in results are not because of similar findings, but because of a lack of participants in this study. The expected results of this study, as mentioned prior, would have been consistent with several previous studies (Schimmelmann et al., 2005; Fakhoury et al., 2001; Cascade et al., 2010; Lambert et al., 2004).

Because there are no results at this time, very little implications can be made about this study. The only assumptions that can be made regarding what the data says about the sample is: a limited number of students in California State University Stanislaus's psychology courses are taking an antipsychotic, or people are unwilling to report that they are taking an antipsychotic. These implications may be caused by issues with receiving a diagnosis, limitations in treatment, or because of the stigma surrounding psychiatric disorders. More research is needed to investigate these implications.

Limitations of the current study involved that of a small sample size and the sample being restricted to one subject on a college campus. SONA studies are only applicable to students in psychology courses whose professors offer study participation for extra credit. Another limitation of the present study was the reliance on self-report data. Even if this study had been able to gather enough qualifying participants, there still would have been an issue of participants answering untruthfully. This is because people tend to respond in socially desirable ways, and not always honestly. COVID-19 also caused a confounding variable that hopefully future research can control for.

Because of the ongoing pandemic, a concern for this study was participants in the side effect group may have misinterpreted any stress they experience from their antipsychotic as being caused by the pandemic, when the true cause of stress was their medication. Future research studies should include larger and more diverse samples that include various age groups to determine how stress is manipulated by antipsychotic side effects, and which side effects cause individuals the most stress. Additionally, future research should focus on attempting a longitudinal design of this study instead of an exponential design. This would allow future research to focus on the duration and severity of side effect stress.

## Acknowledgements

I would like to give a special thank you to my research mentor Professor Deborah S. Forester for guiding me along this process and always supporting me, Professor Jamila Newton for helping me present my research, and the Honors Program for coordinating the Honors Capstone Project as a whole.

## References

- [1] Ananth, J., Burgoyne, K., Gadasalli, R., & Aquino, S. (2001). How so the atypical antipsychotics work? *Journal of Psychiatry and Neuroscience*, 26(5), 385-394. Retrieved from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC167197/>
- [2] Cascade, E., Kalali, A., Mehra, S., & Meyer, J. (2010). Real-world data on atypical antipsychotic medication side effects. *Psychiatric MMC*, 7, 9-12. Retrieved from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2922368/>
- [3] Fakhoury, W., Wright, D., & Wallace, M. (2000). Prevalence and extent of distress of adverse effects of antipsychotics among callers to a United Kingdom National Mental Health Helpline. *International Clinical Psychopharmacology*, 3, 153-162. Retrieved from: [https://journals.lww.com/intclinpsychopharm/Abstract/2001/05000/Prevalence\\_and\\_extent\\_of\\_distress\\_of\\_adverse.4.aspx](https://journals.lww.com/intclinpsychopharm/Abstract/2001/05000/Prevalence_and_extent_of_distress_of_adverse.4.aspx)
- [4] Lambert, M., et al. (2004). Impact of present and past antipsychotic side effects on attitude toward typical antipsychotic treatment and adherence. *European Psychiatry*, 19(7), 415-422. <https://doi.org/10.1016/j.eurpsy.2004.06.031>

[5] Schimmelmann, B., Paulus, S., Schacht, M., Tilgner, C., Schulte-Markwort, M., & Lambert, M. (2005). Subjective distress related to side effects and subjective well-being in first admitted adolescents with early-onset psychosis treated with atypical antipsychotics. *Journal of Child and Adolescent Psychopharmacology*, 15. <https://doi.org/10.1089/cap.2005.15.249>

[6] Stress and your Health. Office on Women's Health. Retrieved from: <https://www.womenshealth.gov/mental-health/good-mental-health/stress-and-your-health>

1. Stress Effects on the Body. American Psychological Association. Retrieved from: <https://www.apa.org/helpcenter/stress/index>

[7] Stroup, S., & Gray, N. (2018). Management of adverse effects of antipsychotic medications. *World Psychiatry*, 17, 341-356. Doi: 10.1002/wps.20567

# Investigating the Role of Inaccurate Diagrams in Student Misconceptions about Plant Metabolism

Jair Torres

*B.S. Candidate, Department of Biological Sciences, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

Received 24 May 2021; accepted 20 July 2021

---

## Abstract

Research in biology education has found that there are prevalent misconceptions about plant metabolism among college-level students. Prior research in science education suggests that misleading diagrams contribute to inaccurate ideas students have about the subject matter in multiple disciplines. Here, we extended this idea about the role visuals play in how students form their ideas to the concept of plant metabolism, that is, how plants transform energy and matter via cellular respiration and photosynthesis. Two groups of Stanislaus State students were randomly assigned either a misleading or updated diagram depicting plants performing different metabolic processes. The participants used these diagrams to answer survey questions designed to test for common misconceptions about plant metabolism, and we compared the average number of misconceptions between each group. We found that although the updated group indeed had fewer misconceptions on average than the group provided with the misleading diagram, the difference was not significant. We were able to identify a misconception that many students from both groups had, namely the idea that plants perform only photosynthesis and not cellular respiration.

*Keywords: Cellular respiration, photosynthesis, metabolism, misconception*

---

## Introduction

It is critical for students enrolled in biology courses to understand metabolism, given that many of life's processes depend on the ability of organisms to convert energy and matter into usable forms. Despite the importance of understanding these concepts, the literature points to widespread misconceptions about plant metabolism, which affects many students, including undergraduate and graduate biology students (Wynn et al., 2017). Given that biology is a STEM course, its content is often interdisciplinary, meaning that an accurate understanding of fundamental biological concepts is transferable to other subjects. This is especially true for understanding transformations of energy and matter since correct knowledge of these concepts is applicable in chemistry and physics (Opitz et al., 2019)

Misconceptions about biology and their sources have been widely researched. Researchers have found that some incorrect ideas are passed directly from instructor to student (Yates & Marek, 2018). Preconceived ideas and modes of thinking also play an important role in forming misconceptions, such as the tendency for biology students to think of photosynthesis primarily as a chemical process instead of a biological one (Urey, 2018). Researchers have also identified common misconceptions students have about photosynthesis and cellular respiration in plants, such as their purpose and the conditions under which they can occur. For example, several studies have demonstrated that students often have the mistaken idea that plants only perform photosynthesis and not cellular respiration (Wynn et al., 2017). In reality, both of these processes are essential for plants to live, given that photosynthesis allows plants to transform sunlight energy into energy stored in the sugar glucose, which plants can then breakdown during cellular

respiration to again transform this energy into a usable form. This usable form of energy is stored in the chemical known as ATP, which all living organisms require.

Another possible source of these misconceptions that has not been widely studied is the role visuals such as diagrams can play. Visual representations like diagrams are often used in STEM classrooms since they can present information in a more memorable way than verbal descriptions and explanations can achieve (Gates, 2017). Nevertheless, improper use of a diagram or use of a misleading diagram could perpetuate many of the common misconceptions previously mentioned. For example, prior research has documented the role of inaccurate diagrams in student misconceptions of other biological concepts such as body systems (Sirovina & Kovacevic, 2019). However, research into the potential role of visual representations of these inaccurate ideas is lacking, given that the role of visuals in how students form their ideas has not been thoroughly examined in the context of biological concepts beyond body systems. In other words, there is not much research into the role that visuals play in student misconceptions about transformations of energy and matter.

In this study, we investigated whether inaccurate visuals such as textbook diagrams contribute to inaccurate ideas students have about plants. For example, do diagrams that depict plants performing only photosynthesis contribute to the inaccurate idea that photosynthesis is all there is to plant metabolism? How can diagrams be improved to emphasize the idea that plants require energy that they can get from metabolizing their own food? We expected that students who were provided accurate diagrams would have fewer misconceptions about the subject matter than students provided with misleading diagrams.

## Methods

For this study, we recruited 21 participants taking an introductory biology class. Participants were 18 years of age or older. We visited the students in their online biology class to describe the study and to ask them to volunteer to take an online survey. Students had to access the survey on the site Qualtrics through a link that we provided.

The survey consisted of three parts: demographic information, preliminary knowledge questions, and experimental questions. First, the participants responded to demographic questions asking for the class the students were enrolled in and the number of years they had been enrolled in the university at the time of the survey. The demographic questions were followed by preliminary questions testing the students' knowledge about metabolism in general before being provided the diagrams. This part of the experiment was included to ensure that students assigned to both groups had comparable background knowledge of the subject matter. After answering the first two parts of the survey, students were randomly assigned either the misleading diagram or the updated diagram (see Figure 2).

Figure 1.

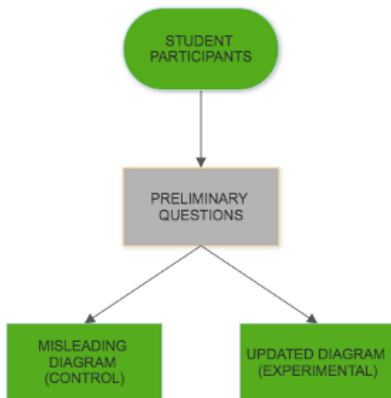


Figure 1. All student participants answered preliminary questions before being randomly assigned a diagram.

The two diagrams were identical except for the fact that the updated diagram depicted plants performing photosynthesis and cellular respiration, unlike the misleading diagram, which depicted plants only performing photosynthesis. Once provided with their respective visual, students from both groups were asked four identical questions testing for common misconceptions. We then compared the average number of misconceptions between each group.

Figure 2. Photosynthesis Diagrams

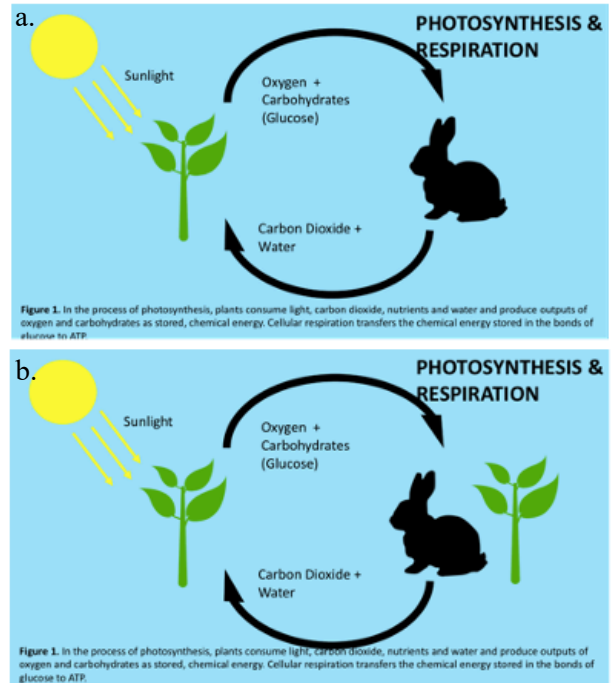


Figure 2. The misleading diagram (a) depicts a plant performing only photosynthesis. The updated diagram (b) is similar to the misleading diagram. The only difference is that the updated diagram depicts plants performing both photosynthesis and cellular respiration, providing a more complete illustration of plant metabolism.

## Results

In this study, we examined the effect of misleading diagrams on student misconceptions about plant metabolism by comparing the number of misconceptions of two groups that were provided with different diagrams. We hypothesized that students provided the misleading diagram would have a larger number of misconceptions than students provided with an updated diagram. Our comparison of both groups revealed that students in the misleading diagram group indeed had more misconceptions than students in the updated diagram group (Figure 1).

**Figure 1. Average total score on Diagram Questions**

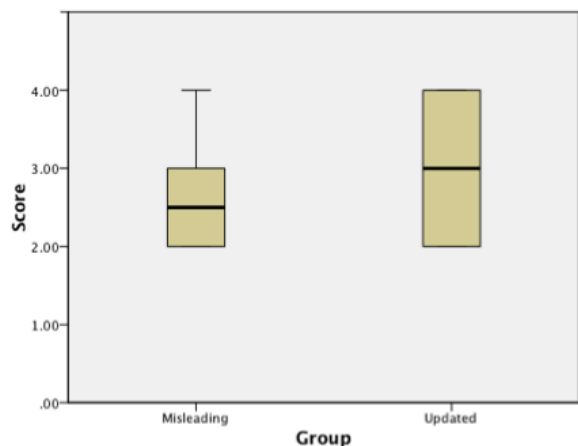


Figure 1. The lowest possible score is 0 and the maximum is 4. The middle bar in the plot represents the mean score. The top and bottom lines of each plot represent the range of scores in each group. A higher score indicates fewer misconceptions.

There were some individuals in the misleading diagram group that reported zero misconceptions. However, fewer participants in this group answered all the questions correctly than the updated group. To determine if this difference was significant, we conducted a two-sample t-test at the  $\alpha = .05$  level. Our statistical analysis yielded a non-significant result ( $p = .061$ ). Given that the result of the two-sample t-test was not significant at the alpha level of  $.05$ , there is not enough evidence to claim that the diagram's accuracy affected the number of misconceptions the student participants had.

**Figure 2. Correct responses to preliminary questions**

| Question   | Misleading Group (n = 11) | Updated Group (n = 14) | P-Value |
|--|---------------------------|------------------------|---------|
| Animals require energy to survive.                                   | 100%                      | 100%                   | —       |
| Plants require energy to survive.                                    | 100%                      | 100%                   | —       |
| In which organelle (cell part) does photosynthesis take place?       | 91.10%                    | 100%                   | .134    |
| In which organelle (cell part) does cellular respiration take place? | 72.73%                    | 85.7%                  | .220    |
| Which of the following perform photosynthesis?                       | 100.00%                   | 92.86%                 | .193    |
| Which of the following perform cellular respiration?                 | 54.5%                     | 85.7%                  | .046*   |

Figure 2. Proportions of students who responded correctly to each preliminary question A dash (—) indicates no difference between the two groups for that question.

Despite the non-significant result for the t-test, we were able to identify a common misconception. The responses to the preliminary survey questions revealed that the most common misconception among the participants was the idea that only animals perform cellular respiration and that plants only perform photosynthesis (Figure 2). In both groups, the question testing for this misconception had the lowest proportion of correct responses at 54.4% for the misleading group and 85.7% for the updated group. Prior research has identified this idea as common among students, and the results of this study support this finding. The idea that plants do not perform cellular respiration may stem from the idea that plants receive their energy directly from

the sun and not through the glucose that they make.

**Figure 3. Correct responses to diagram questions**

| Question   | Misleading Group (n = 11) | Updated Group (n = 14) | P-value |
|--|---------------------------|------------------------|---------|
| Based on the diagram, plants use carbohydrates during cellular respiration to make ATP.  | 45.5%                     | 64.3%                  | .184    |
| Based on the diagram, animals use carbohydrates during cellular respiration to make ATP. | 81.8%                     | 92.86%                 | .210    |
| Based on the diagram, which of the following can perform photosynthesis?                 | 81.8%                     | 100%                   | .0521   |
| Based on the diagram, which of the following can perform cellular respiration?           | 72.7%                     | 78.6%                  | .215    |

Figure 3. Proportion of participants who responded correctly to each diagram question. A higher value indicates that a larger proportion of students in that group did not have the misconception tested for by the question.

After answering the preliminary questions, students were randomly assigned their diagram, which they could use to answer the next set of questions. Figure 3 shows each of the questions presented to the students and the proportion of students in each group who answered the question correctly. For each question, the updated diagram group had a larger proportion of students who responded correctly to the question, although the differences were not significant. Nevertheless, the student responses to the experimental questions revealed a common misconception that students from both groups had, namely the idea that plants do not require carbohydrates as an energy source. This is consistent with the data gathered from the preliminary responses, which also revealed that a large proportion of students had the misconception that only animals and not plants perform cellular respiration. Although the students in the updated diagram group performed significantly better on the question testing for this misconception in the preliminary questions ( $p = 0.046$ ) before receiving their diagram, both groups had comparable proportions of students who did not understand that plants require carbohydrates. This discrepancy may arise from the fact that students who understood that plants indeed perform cellular respiration did not understand that glucose is necessary for this process to occur. Prior research suggests that a common misconception that students have is the idea that plants get energy directly from the sun, which may explain why some students did not realize that carbohydrates are essential sources of energy for plants.

In short, students exposed to the updated diagram had fewer misconceptions than those provided with the misleading diagram, but the difference was not significant. However, we must consider that the students who were surveyed had already covered metabolism in class and the sample size was small. Conducting this research early in the semester, before the students are exposed to the concepts of metabolism in class, could provide greater insight into whether diagrams can significantly influence the ideas a student has about plant metabolism. Furthermore, increasing the sample size could help generalize these findings to a larger population.

## Future work

Because this study's scope is limited primarily to the role visuals play in misconceptions, it will have limitations in its results. For instance, prior student knowledge about photosynthesis could influence how many questions participants were able to correctly answer, which could explain why some participants in the misleading diagram group were able to answer each question correctly. Furthermore, we did not expose the students to their respective diagrams in the context of a larger lesson like researchers did in previous studies. Perhaps short exposure to the diagram is not enough to affect how accurate a student's ideas of the subject matter will be. In addition, students familiar with the topic may not study the diagrams and may directly respond to the questions. The sample size was also limited to students enrolled in introductory biology. Consequently, our results cannot be generalized to a larger population. Further studies about the role visuals play in how students form misconceptions can better control for alternative sources of misconceptions, such as prior knowledge of the topic. Future studies can also focus on diagrams in areas of biology outside the concept of metabolism.

## Acknowledgements

I would like to thank Dr. Sarah Bissonnette, my faculty advisor, and Dr. Jamila Newton from the biological sciences department for mentoring me and guiding me during this project. This project would not have been possible without their help and insight. I would also like to thank the Honors Program for providing resources and for supporting me throughout the completion of this project.

## References

- [1] Gates, P. (2018). The importance of diagrams, graphics and other visual representations in STEM teaching. In *STEM education in the Junior Secondary* (pp. 169-196). Springer, Singapore.
- [2] Opitz, S. T., Neumann, K., Bernholt, S., & Harms, U. (2019). Students' energy understanding across biology, chemistry, and physics contexts. *Research in Science Education*, 49(2), 521-541.
- [3] Sirovina, D., & Kovacevic, G. (2019). Importance of an Appropriate Visual Presentation for Avoiding a Misconception of the Menstrual Cycle. *Journal of Biological Education*, 53(3), 302-309.
- [4] Urey, M. (2018). Defining the Relationship between the Perceptions and the Misconceptions about Photosynthesis Topic of the Preservice Science Teachers. *European Journal of Educational Research*, 7(4), 813-826.
- [5] Wynn, A. N., Pan, I. L., Rueschhoff, E. E., Herman, M. A., & Archer, E. K. (2017). Student misconceptions about plants—a first step in building a teaching resource. *Journal of microbiology & biology education*, 18(1).

- [6] Yates, T. B., & Marek, E. A. (2014). Teachers teaching misconceptions: a study of factors contributing to high school biology students' acquisition of biological evolution-related misconceptions. *Evolution: Education and Outreach*, 7(1), 7.

# Teaching Robots Biologically Inspired Tasks

Emma Van Hoogmoed

*B.S Candidate, Department of Computer Science, California State University Stanislaus, 1 University Circle, Turlock CA 95382*

Received 16 April 2021; accepted 20 July 2021

---

## Abstract

This paper will cover how I utilized a neural network to train a Jetbot to imitate predator-prey relationships. The Jetbot was created using blueprints provided by NVIDIA. The robot was trained using PyTorch and its various open-source libraries. The goal of this project was to improve upon the research conducted by William Grey Walter and Michael Arbib. Both conducted previous work on replicating animal behavior through predator-prey relationships to examine the interconnectedness of the brain. By replicating their research using a neural network, I can better emulate predator-prey relationships and closely analyze the connectivity of the brain.

*Keywords: neural network, robotics, biology, machine learning*

---

## Introduction

Robotics has seen a dramatic evolution since its advent. Early robotics saw its place in a child's playroom as wind-up toys with preprogrammed motions (Nocks, 2017). Now robotics can be seen in hospitals assisting with complex surgeries (Bogue, 2011) or in disaster zones searching for survivors (Tadokoro, 2005). A major contributor to this evolution was the inspiration garnered from biological beings.

Scientists looked to the anatomy of living creatures to overcome challenges with robotic movement. Big Dog was developed by Boston Dynamics to overcome problems faced by wheeled robots (Raibert et al., 2008). Another example is micro aerial vehicles (MAVs). The downside to using these was its inability to land anywhere. Scientists looked to flying insects to solve this problem and developed a MAV that can perch and take off from any surface and consequently land safely (Granule et al., 2016).

Scientists also analyzed behaviors to understand and implement complex thinking. Two examples are William Grey Walter's tortoises (Walter, 1953) and Michael Arbib's Rana Computatrix (Arbib 2003). Walter and Arbib studied predator-prey relationships in various animals and replicated these behaviors using the technology available to them at the time. They believed that by studying these relationships they would gain insight into the association between brain and action (Arbib, 2003). Both will be discussed further in the background section of this paper as they are the direct inspiration for this project.

This project sought to improve on the previous work done by Walter and Arbib by utilizing a neural network. A neural network is a mathematical-based learning system that uses a network of functions to understand various kinds of data. The concept originated from human biology and how the human brain functions using neurons to interpret inputs from the biological senses (Schmidhuber, 2015). Our goal was to mimic predator-prey behaviors by training the neural network to identify predator versus prey and assigning actions to the different identifications. By doing this, we could observe how the brain interprets situations and executes actions.

## Previous Research

There has been extensive research into predator-prey relationships with regard to robotics. Two of the most fundamental projects are William Grey Walter's tortoises and Michael Arbib's Rana Computatrix. Walter's tortoises were inspired by neuroscience and the complex interconnectedness of neurons within the brain (Walter, 1953). Arbib wanted to improve on Walter's work by making the thinking process more like the biological life form he based his robots on (Arbib, 2003). Both scientists were interested in exploring predator-prey behaviors as a means for understanding thinking.

William Grey Walter is considered a founding father of creating authentic artificial life (Holland, 1997). He achieved this honor through the creation of a series of tortoises designed to replicate complex behaviors by utilizing a rich interconnectedness between a minimal number of

parts (Walter, 1953). Walter's first design was called the "Machina Speculatrix" which roughly translates to "machine that thinks" (Mataric, 2007). It was a simple design with the only resemblance of a tortoise being its clear plastic shell protecting the inner mechanical components.

There was one driving wheel controlled by a steering and driving motor. Attached to this wheel was a single photoelectric cell. This cell took in the light as sensory input and was attached to the driving wheel to ensure it was always pointing in the direction the robot was facing. The robot was taught to react to light in specific ways. If the light was of high intensity, it was programmed to flee. If the light was of low intensity, it was programmed to approach. This mimicked remedial predator-prey behavior exhibited in tortoises and other animals (Walter, 1953).

Michael Arbib believed that while Walter's tortoises were a pivotal invention in robotics evolution, they were not truly "thinking" machines. He sought to improve on Walter's research by creating his own set of robots exhibiting frog and toad-like visuomotor coordination. He began by making robots with basic predator-prey functions, like those of Walter's tortoises. A small object would represent a prey, while a large object would represent a predator. If a small moving object were presented, the robot would snap at the object. If a large moving object is in view, the robot would avoid the object. Arbib took this a step further by relating the behavior to the anatomy of a frog (Arbib, 2003).

Each eye of a frog sends visual information to the opposite side of the brain, and the midbrain region known as the tectum. Layered in front of the tectum is the pretectum. Arbib made the hypothesis that the small moving object identification and the resulting action are in the tectum while the large moving identification and corresponding action are in the pretectum. Through this additional programming, Arbib observed an interesting behavior. When two small moving objects were identified, the robot would snap in between the two objects rather than picking one over the other (Arbib, 2003). The same behavior can be observed in sentient frogs. This showed that Arbib was successfully able to mimic animal behavior in his Rana Computatrix and create a truly thinking machine (Murphy, 2019).

### **Methodology**

Inspired by these two scientists, I sought to replicate predator-prey behavior to study the interconnectivity of the brain. To improve on their work, I utilized a neural network to better model a

biological brain. I trained this neural network to identify a blue pool ball as a predator and a yellow pool ball as a prey. I then analyzed what this programmed behavior can teach us about biological behavior. The remainder of this paper will discuss the details of how this was accomplished.

There are several different ways to examine the interconnectivity of the brain. For this project, I focused on functional connectivity. Functional connectivity is based on statistics and refers to parts of the brain that are dependent on one another regardless of having direct structural links (Sporns, 2007). The living brain relies heavily on statistics to manage the flow of information gathered from the environment and determine behavioral output (Chen, 2019). Because of this, neural networks are designed to make decisions based on statistical inferences to model the brain as closely as possible.

For the design of the robot, I decided to use NVIDIA's Jetbot. NVIDIA provides all design files and a complete list of parts to create the Jetbot from scratch on GitHub. My mentor, Dr. Xuejun Liang, followed this guide to construct the Jetbot I used for this project. The Jetbot utilizes the computational power of the Jetson Nano. This computer allows users to run multiple neural networks in parallel (NVIDIA). I also decided to use the convolutional neural network (CNN) AlexNet.

AlexNet is different from earlier CNNs due to its hierarchical image classification structure. At the lower layers of the network, images are seen as highly pixelated with low resolution. This layer is used to determine rough features like the edges of an object or color. At the higher layers, images are processed in greater detail. By performing image classification in this manner, the computational time is greatly decreased allowing large datasets to be analyzed and the creation of accurate models to be produced (Krizhevsky et. al, 2012). Due to these advantages, AlexNet was an ideal CNN for the project.

I trained the robot to perform three actions, collision avoidance, avoidance of predators, and attraction to prey. The intention of teaching the robot collision avoidance was to simulate an animal moving about its territory while looking out for predators or prey. I used a table to simulate its territory and two pool balls to represent predator vs prey.

I first created categories that separated and labeled images taken from a mounted camera. These categories were: blocked, free, predator, and prey.



The categories blocked and free were specific to the collision avoidance function. These simply signified whether the robot was free to continue its path or if it should stop to avoid a collision. The categories predator and prey refer to when there is a predator or prey in the robot's field of view.

To train the model to recognize these categories, I took two hundred pictures using the mounted camera for each category. These pictures were stored in the Jetson nano in their corresponding directories. For the collision avoidance, I slowly moved the robot along the edge of a table taking a picture about every inch and labeling this "blocked". I then moved the robot around the table first horizontally, then vertically, and lastly diagonally across every movable inch. These were labeled "free". For the predator-prey responses, I took pictures with a blue pool ball in its vision and a yellow pool ball in its vision. The blue pool ball was used to represent a predator. The yellow was used to represent the prey. It was important to take these pictures at different times during the day as the table that was used was next to a window and the change of light affected the accuracy of the model. I then ran these images through a training program.

AlexNet divided the image set equally. Half of the set was used to train the model and the other half was used as a test set. While a higher number of epochs is favored, five epochs were used to find the best training model. This was due to the large number of images the training algorithm had to handle. With just the collision avoidance being trained (400 images), it was easy to have ten epochs. The time for compilation was too costly to maintain the ten epochs when the combined total for the predator and prey detection and the collision avoidance (1,000 images) were used. Therefore, the number of epochs was reduced to 5 to allow for retraining if necessary. The training program would calculate the accuracy of each epoch and pick the best one to assign as the model.

The final step was to program behaviors for each category. This was done using a series of if-else statements. For the collision avoidance, if the probability of the view being blocked was greater than 0.5 or 50%, the robot would first move back then to the left. Otherwise, it would continue forward. For the predator-prey identification, if the probability of a predator being in the view was greater than 0.5, then the robot would move backward. If the probability of prey being in view was greater than 0.5, then the robot would move forward.

## Results

The robot was able to successfully execute collision avoidance. It was also able to differentiate between predator and prey. When presented with the blue ball, it moved away from it. Thus, showing it recognized it as a predator and avoided it appropriately. When presented with a yellow ball, it moved towards it. Proving that it identified it as a prey and responded correctly.

To test the robot's thinking, different colors of pool balls were used. A black, green, red, and orange ball was placed in view of the robot. When presented with the black or green balls, the robot responded as if there was a predator in sight. When presented with the red or orange balls, the robot would identify them as prey. If both the black and green ball were used, it would once again react as if it is seeing a predator. If both the red and orange ball were used, it would identify them as being prey and move towards them. If any of the combinations of a dark-colored ball and a light-colored ball was used, it would only identify the prey and move towards the object.

## Conclusion

Using a neural network allowed us to closer examine functional connectivity due to its statistics-based approach. Like our brains, a neural network makes guesses as to what is identifying based on previous knowledge. This was exemplified when it was exposed to a color of a ball it had not seen before. For example, when exposed to the black ball, it responded as if it was exposed to a blue ball. This is due to the robot's limited knowledge base. The robot was only programmed to respond to a situation where a blue ball was in view or when a yellow ball was in view. Upon seeing the black ball, it had to make a statistical guess about what it was seeing and therefore thought it was more likely a blue ball in view rather than a yellow one. It then acted accordingly and moved away from the ball. By observing this behavior, it is clear that actions are dependent on statistical inferences made by the brain.

## Future Research

In continuing this project, I would like to pick a specific animal and model its brain as closely as possible. By doing this, I could better analyze the brain processes the living creature would perform. Additionally, it would be interesting to add more features such as stalking the prey upon recognition. This way, I can examine how the brain performs different types of actions. For predator recognition, it would be

interesting to add a defense mechanism that relates to the specific animal I would be attempting to model. By doing this, it would be easier to see what steps the brain needs to take and can be compared to the brain usage different defense mechanisms need. This project has a lot more potential, and it is something I suspect others will expand on in the future.

### Acknowledgments

This project is funded by The Ronald E. McNair Postbaccalaureate Achievement which is federally funded through the U.S. Department of Education. Special thanks to my faculty mentor, Dr. Xuejun Liang.

### References

- [1] Arbib, M. (2003). Rana computatrix to human language: Towards a computational neuroethology of language evolution. *Philosophical Transactions. Series A, Mathematical, Physical, and Engineering Sciences*, 361(1811), 2345-2379.
- [2] Bogue, R. (2011), "Robots in healthcare", *Industrial Robot*, Vol. 38 No. 3, pp. 218-223. <https://doi.org/10.1108/01439911111122699>
- [3] Chén O. Y. (2019). The Roles of Statistics in Human Neuroscience. *Brain sciences*, 9(8), 194. <https://doi.org/10.3390/brainsci9080194>
- [4] Graule, M., Fuller, S., Jafferis, N., Ma, J., Spenko, M., Wood, R. (2016). Perching and takeoff of a robotic insect on natural and artificial overhangs using switchable electrostatic adhesion. *Science* 352, 978.
- [5] Krizhevsky, A., Sutskever, I., & Hinton, G. E. (2012). Imagenet classification with deep convolutional neural networks. *Advances in neural information processing systems* (pp. 1097–1105).
- [6] Nocks, L. (2019). Review: A New Exhibition Shows That Humanoid Robots May Have Been Around Longer Than You Think. *IEEE Spectrum: Technology, Engineering, and Science News*. <https://spectrum.ieee.org/robotics/humanoid-s/review-a-new-exhibition-shows-that-humanoid-robots-have-been-around-longer-than-you-think>
- [7] Nvidia-Ai-Iot. (2020, January 16). NVIDIA-AI-IOT/jetbot. Retrieved from <https://github.com/NVIDIA-AI-IOT/jetbot>
- [8] Raibert, M., Blankespoor, K., Nelson, G. (2008). Big Dog, the Rough-Terrain Quadruped Robot. 41(2), 10822-10825. <https://doi.org/10.3182/20080706-5-KR-1001.01833>. IFAC Proceedings Volumes.
- [9] Schmidhuber, J. (2015). Deep learning in neural networks: An overview. *Neural Networks*, 61, 85-117.
- [10] Sporns, O. (2007). Brain connectivity. *Scholarpedia*, 2(10): 4695.
- [11] Tadokoro, S. (2005). Special project on development of advanced robots for disaster response (DDT project). *IEEE Workshop on Advanced Robotics and Its Social Impacts*, 2005., 66–72. <https://doi.org/10.1109/arso.2005.1511621>
- [12] Walter, W. G. (1953). *The living brain*. London: Duckworth. (Pelican edn, 1961. Harmondsworth: Penguin Books

# Risk Behaviors Among Overweight/Obese U.S. Adolescents: An Examination of the 5-2-1-0 Recommendations and the Impact of Individual Factors

Guadalupe Villanueva

*B.S. Candidate, Department of Kinesiology, Exercise Science Major, California State University Stanislaus, 1 University Circle,  
Turlock, CA 95382*

Received 16 April 2021; accepted 20 July 2021

---

## Abstract

In the U.S., obesity levels are very high, it is prevalent among adolescents and is later seen in adulthood. Obesity leads to multiple health diseases such as cardiovascular diseases, diabetes, cancer, earlier death, among others. The purpose of this study is to examine whether and to what extent overweight/obese adolescents engage in other health-risking behaviors. We examined whether there are sex differences in the health risk behaviors and what role individual factors such as race, and school experiences play in engaging in these risk behaviors among overweight/obese U.S. adolescents using the 5-2-1-0 recommendations for children and adolescents. The 2017 YRBSS data was used to examine sex differences, substance use, physical and sedentary activity among U.S. overweight/obese adolescents to identify who is more at risk. We will examine if all these factors are interrelated and how they culminate to predispositions in health diseases later into adulthood. Compared with normal weight adolescents, overweight and obese adolescents are more likely to participate in health risk behaviors such as alcohol use (29.2%, 29.8%), marijuana use (21.7%, 20.9%), and sexual activity (30.1%, 26.7%). Findings suggest that female and male overweight and obese adolescents engaged in risk behaviors such as cigarette, alcohol and marijuana use, sex, and not meeting the 5-2-1-0 recommendations for the 5 servings of fruit and vegetable intake, 2 hours or less of daily screen time, and at least one hour of physical activity.

*Keywords: Obesity, Adolescents, Health-risk behaviors*

---

## Introduction

The National Center for Health Statistics reports that in 2015–2016, the prevalence of obesity among youth aged 12-19 years was 20.6%, however, the report found no significant difference in obesity prevalence among male and female youth (20.4% and 20.9% respectively) (Amuta, Jacobs, & Barry, 2017; Hales, Carroll, Fryar, & Ogden, 2017). Adolescents who are overweight or obese have an increased risk of developing a wide range of health conditions in adulthood, such as high blood pressure, heart disease and strokes, certain types of cancer, kidney disease, and type II diabetes (Kann et al., 2016; Reilly & Kelly, 2011; Schneider, Zhang, & Xiao, 2020). Overweight/obese adolescents are also at increased risk for social isolation and discrimination which is linked to low self-esteem and poor mental health, hence, why understanding the determinants and impact of obesity among adolescents remains a major public health concern (Haughton, Wang, & Lemon, 2016; Jacobs et al., 2020a).

Obesity is a serious, complex, and multi-factor health problem that results from the interaction of individual, genetic, and environmental factors (Webster & Staiano, 2020). Several prevention efforts (such as the Healthy people 2020, the 2008 Physical Activity Guidelines for America, and the 2010 Dietary Guidelines for Americans) target the establishment of healthy dietary and physical activity behaviors during childhood and adolescence to prevent and reduce the future consequences of overweight/obesity (P. A. G. A. Committee, 2008; U. S. D. G. A. Committee, 2010; Health & Services, 2008; US Department of Health and Human Services). These national

guidelines were succinctly summarized by The Maine Youth Overweight Collaborative as the “Let’s Go! 5-2-1-0” youth obesity prevention program (Rogers et al., 2013). The “5-2-1-0” guidelines consist of “5 servings of fruits and vegetables, ≤2 hours of screen time, >1 hour of physical activity, and 0 sugar-sweetened beverages daily (Khalsa, Kharofa, Ollberding, Bishop, & Copeland, 2017).

In addition to the unhealthy dietary habits and physical inactivity that contribute to the obesity epidemic among adolescents, their health and well-being is also influenced by other health risk behaviors (Farhat, Iannotti, & Simons-Morton, 2010). The Centers for Disease Control (CDC) identified 1) tobacco use, 2) alcohol use and 3) sexual behaviors related to unintended pregnancy and sexually transmitted diseases as important leading causes of mortality, morbidity, and social problems among adolescents (U.S. Department of Health and Human Services). During adolescence, experimentation with health-risking behaviors is common and even normative as it is a part of the developmental process where adolescents engage in risk behaviors to assert independence or cope with stressful life events (Amuta et al., 2017; Farhat et al., 2010). Particularly for overweight/obese adolescents, using alcohol and tobacco and engaging in risky sexual behaviors could be problematic given the well-documented independent effects of these behaviors on health and health outcomes in the immediate (e.g., injuries, poor academic performance, sexually transmitted infections, teen pregnancy) and long-term (e.g., addiction, HIV) (Boden, Fergusson, & FRSNZ, 2011; Xu, Jacobs, Church, Ning, & Lu, 2018).

Substances, including alcohol, nicotine, and

marijuana, have been known to affect appetite and consequently BMI differently (Li, Yang, Davey-Rothwell, & Latkin, 2016; Sansone & Sansone, 2013). Evidence suggests a positive relationship between alcohol, tobacco, and marijuana (cannabis) consumption and a greater risk of obesity and obesity-related health problems (Boden et al., 2011; Lanza, Pittman, & Batshoun, 2017). For example, the often-overlooked excess calories in alcohol, which have no nutritional value yet tend to be additive to the diet, is linked to excessive weight gain (Kate, 2017). Marijuana use has also been linked to increased appetite for both healthy and unhealthy diet and is also found to foster sedentariness (Farokhnia et al., 2020; Xu et al., 2018). Although research on the relationship between obesity and tobacco product (electronic and combustible) use is complex and sometimes produce conflicting results, cross-sectional and longitudinal studies have shown cigarette smoking is linked to higher weight status (Boden et al., 2011; Dhariwal, Rasmussen, & Holstein, 2010; Farhat et al., 2010; Lanza et al., 2017; Sansone & Sansone, 2013).

Limited studies have examined overweight/obesity within the 5-2-1-0 guidelines especially among an adolescent sample. Further, although research suggests gender moderates the association of body weight and risk behaviors, studies examining gender differences in the association of health-risk behaviors (cigarette, e-cigarette, and marijuana use, and risky sexual activity) with overweight/obesity among a nationally representative sample are limited (Farhat et al., 2010). The purposes of this study are therefore to examine the gender differences in the association of overweight/obesity with the 5-2-1-0 recommendation and health risk behaviors among adolescents. We hypothesize the following: 1) compared to their normal weight counterparts, overweight/obese adolescents will have a reduced likelihood of meeting the 5-2-1-0 guidelines, 2) the association between weight status and odds of engaging in different health-risk behaviors will be different for male and female adolescents, and 3) females will show a higher risk for multiple health -risk behaviors compared to males.

## **Methods**

### *Participants*

This study includes data from the 2017 national Youth Risk Behavior Survey (YRBS). The YRBS is a cross-sectional, school-based survey conducted biennially among 9th – 12th grade students from a nationally representative sample of public and private school students in the 50 U.S. states and the District of Columbia. Detailed information about the survey methodology, sampling, and response rates is published elsewhere (Kann et al., 2016).

### *Measures*

**Weight status.** The YRBS asked participants to indicate their age, sex, weight, and height which was used to compute BMI percentile by age and sex. The YRBS-provided BMI percentile information was used to classify youth into three mutually exclusive categories. When BMI percentile was at or above the 95th percentile, weight status was set to obese; when percentile was at or above 85th percentile, weight status was set to overweight; and BMI percentile below the 85th percentile was set as under/about the right weight.

**Substance use.** Current tobacco, e-cigarette, and alcohol use was assessed by the following three questions; “During the past 30 days, on how many days did you smoke cigarettes?”; “During the past 30 days, on how many days did you use an electronic vapor product?”; and “During the past 30 days, on how many days did you have at least one drink of alcohol?”. Response options included “0 days”, “1 or 2 days”, “3 to 5 days”, “6 to 9 days”, “10 to 19 days”, “20 to 29 days”, and “all 30 days”. Students who reported >0 days were classified as current tobacco users, current e-cigarette users, and current alcohol users, respectively. Current marijuana use was measured with the question: “During the past 30 days, how many times did you use marijuana?”. Response options included, “0 times”, “1 or 2 times”, “3 to 9 times”, “10 to 19 times”, “20 to 39 times”, and “40 or more times”. Participants who indicated >0 days of marijuana user were classified as current users.

**Sexual behaviors.** Two variables were used to assess sexual behaviors. One question asked about how many people participants had had sexual intercourse with during the past 3 months. Using the YRBS-provided dichotomized variable, participants who indicated  $\geq 1$  person was classified as being currently sexually active. Another question assessed condom use during the last sexual intercourse. The YRBS-provided dichotomized variable classified youth into two categories: “yes” or “no” and excluded those who did not have sex during the past 3 months.

### *‘5-2-1-0’ Behaviors*

**‘5’ – fruit and vegetable intake.** Six questions measured past 7-day fruit (including 100% fruit juice) and vegetable intake, and asked about participants’ intake of fruit, fruit juice, green salad, potatoes (excluding fries, fried potatoes, or potato chips), carrots, and other vegetables intake in the past week. Response options ranged from “did not eat...” to “4 or more times per day”. To determine the daily intake of fruits and vegetables, each participant’s responses to all six questions were averaged and then divided by seven. These averaged values were then dichotomized to determine whether participants met the ‘5’ recommendation and consumed  $\geq 5$  servings/day of fruits and vegetables or did not meet the recommendation and consumed  $< 5$  servings/day of fruits and vegetables.

**‘2’ – screen time.** Two questions assessed daily screen time of: watching TV and playing video/computer games or use of a computer for something other than schoolwork. Responses to both questions was summed to estimate total number of screen time hours. These summed values were then dichotomized to determine whether participants met the ‘2’ recommendation and had  $< 2$  hours/day of non-school related screen time or did not meet the recommendation and had  $> 2$  hours/day of non-school related screen time.

**‘1’ – physical activity.** One question assessed past 7-day physical activity and asked whether participants were physically active for at least 60 minutes/day in the past week. To determine daily physical activity, participants had to report they were physically active on all seven days. These responses were then dichotomized to determine whether participants met the ‘1’ recommendation and were physically active for  $> 1$  hour/day or did not meet the

recommendation and were not physically active for <1 hour/day.

**‘0’- sugar-sweetened beverage intake.** One question assessed past 7-day sugar-sweetened beverage intake, and asked about participants’ intake of a can, bottle, or glass of soda or pop (not counting diet soda or diet pop) in the past seven days. Participants met the ‘0’ recommendation if they consumed 0 sugar-sweetened beverages/day and did not meet the recommendation if they consumed >1 sugar-sweetened beverage/day.

*Statistical Analysis*

Data were weighted on sex, race/ethnicity, and grade level to allow for survey design and differences in school and student nonresponse and oversampling of Non-Hispanic Black and Hispanic students. Prevalence of use of each substance examined in this study and meeting the “5-2-1-0” recommendations was estimated. Statistically significant differences by weight status were estimated for demographic variables, substance use variables, and the “5-2-1-0” recommendations using chi square tests. Then, adjusting for grade, sex, ethnicity, and past 30-day use of other tobacco products, separate adjusted logistic regression models were constructed to determine association each health risk behavior (cigarette use, e-cigarette, alcohol, marijuana, sexual activity, and condom use) and meeting each ‘5-2-1-0’ recommendations (‘5’ fruits and vegetables, ‘2’ screen time, ‘1’ physical activity, ‘0’ sugar-sweetened beverage) with weight status (reference category=under/about the right weight). Because the impact of weight is influenced by gender, we conducted a follow-up adjusted regression analyses to determine the association of each health risk behavior and the ‘5-2-1-0’ recommendation with weight status for each sex. Results were considered significant when the alpha value was < 0.05. Adjusted odds ratio was calculated using the complex samples logistic regression procedure (CSLOGISTIC) in IBM SPSS Statistics 26.

**Results**

To begin, we looked at the sex and weight status of the sample (N=14765). Figure 1 shows the participants’ sex and weight status computed using BMI percentiles. Overall, half of the participants were females. Of the female sample, 70.2% were in the normal weight range, 17.5% were overweight, and 12.4% obese. 67.5% of males in the study were of normal weight, 15.2% were overweight, and 17.3% were obese.

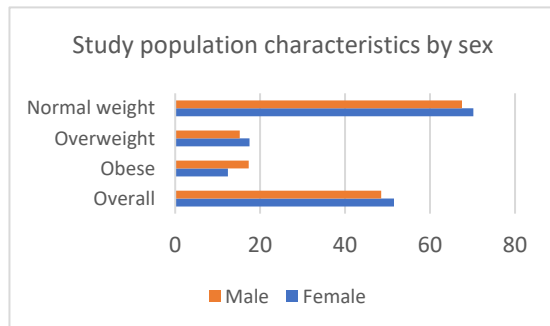


Figure 1. Participant characteristics based on sex

There was a significant difference in weight status

between adolescents who reported cigarette use (p=0.004), marijuana use (p=0.01), current sexual activity (p=0.013), and use of condoms. There were also differences in weight status and meeting the ‘5-2-1-0’ recommendations for preventing obesity (see Table 1). There were no statistically significant differences in weight status among those who do or do not use e-cigarettes, marijuana, and practiced safe sex during their last sexual encounter (i.e., used condoms).

| Health risk behaviors              | Overall (%) | Normal weight (%) | Overweight (%) | Obese (%) | χ <sup>2</sup> |
|------------------------------------|-------------|-------------------|----------------|-----------|----------------|
| <b>Cigarette Use</b>               |             |                   |                |           |                |
| No                                 | 89.9        | 69.3              | 16.3           | 14.4      | 10.96**        |
| Yes                                | 8.0         | 64.9              | 17.3           | 17.8      |                |
| <b>E-cigarette</b>                 |             |                   |                |           |                |
| No                                 | 86.5        | 69.2              | 16.4           | 14.4      | 0.72           |
| Yes                                | 13.5        | 68.7              | 16.1           | 15.3      |                |
| <b>Alcohol Use</b>                 |             |                   |                |           |                |
| No                                 | 62.7        | 69.5              | 16.2           | 14.3      | 0.27           |
| Yes                                | 26.0        | 69.2              | 16.1           | 14.7      |                |
| <b>Marijuana Use</b>               |             |                   |                |           |                |
| No                                 | 78.6        | 69.5              | 16.0           | 14.5      | 8.97*          |
| Yes                                | 19.4        | 66.5              | 18.0           | 15.5      |                |
| <b>Sexual Activity</b>             |             |                   |                |           |                |
| No                                 | 63.8        | 68.3              | 16.2           | 15.5      | 8.66*          |
| Yes                                | 25.9        | 69.4              | 17.2           | 13.4      |                |
| <b>Condom Use</b>                  |             |                   |                |           |                |
| No                                 | 45.1        | 44.1              | 17.4           | 14.7      | 4.28           |
| Yes                                | 54.9        | 55.9              | 16.8           | 12.4      |                |
| <b>5-2-1-0 Recommendation</b>      |             |                   |                |           |                |
| <b>‘5’ Fruits &amp; vegetables</b> |             |                   |                |           |                |
| No                                 | 87.7        | 68.0              | 16.2           | 14.4      | 13.21*         |
| Yes                                | 12.3        | 70.8              | 17.3           | 17.4      |                |
| <b>‘2’ Screen time</b>             |             |                   |                |           |                |
| No                                 | 66.0        | 67.3              | 16.7           | 15.9      | 35.73**        |
| Yes                                | 34.0        | 72.1              | 15.6           | 12.4      |                |
| <b>‘1’ Physical activity</b>       |             |                   |                |           |                |
| No                                 | 73.2        | 67.4              | 16.8           | 15.8      | 50.36**        |
| Yes                                | 23.7        | 73.7              | 15.0           | 11.4      |                |
| <b>‘0’ Sugar (Soda)</b>            |             |                   |                |           |                |
| No                                 | 70.4        | 68.2              | 16.4           | 15.4      | 13.24**        |
| Yes                                | 26.9        | 70.6              | 16.5           | 12.9      |                |

\*p<0.05 \*\*p<0.01

Table 1. Weight status and health risk behaviors among adolescents

Table 2. Weight status and health risk behaviors among US youth

|                                  | Females |            |           |       |           | Males      |           |       |          |
|----------------------------------|---------|------------|-----------|-------|-----------|------------|-----------|-------|----------|
|                                  | Normal  | Overweight |           | Obese |           | Overweight |           | Obese |          |
|                                  |         | OR         | 95% CI    | OR    | 95% CI    | OR         | 95% CI    | OR    | 95% CI   |
| <b>Substance use</b>             |         |            |           |       |           |            |           |       |          |
| Cigarette use <sup>φ</sup>       | Ref     | 1.6        | .97-2.63  | 1.72* | 1.10-2.69 | 1.13       | .69-1.85  | 1.23  | .70-2.14 |
| E-cigarette use <sup>†</sup>     | Ref     | .69        | .45-1.05  | .76   | .56-1.02  | .93        | .67-1.27  | .43   | .57-1.27 |
| Alcohol use                      | Ref     | 1.06       | .86-1.31  | 1.03* | .83-1.28  | 1.25       | .98-1.60  | 1.12  | .86-1.46 |
| Marijuana use                    | Ref     | 1.25*      | 1.04-1.51 | 1.33* | 1.06-1.67 | 1.03       | .88-1.20  | .84   | .66-1.07 |
| <b>Sexual behaviors</b>          |         |            |           |       |           |            |           |       |          |
| Currently sexual activity        | Ref     | 1.11       | .87-1.40  | .70*  | .53-.91   | 1.31*      | 1.06-1.63 | .82   | .64-1.05 |
| Condom use ‡                     | Ref     | .89        | .62-1.28  | 1.01  | .67-1.81  | .98        | .71-1.36  | .84   | .59-1.20 |
| <b>5-2-1-0 recommendation</b>    |         |            |           |       |           |            |           |       |          |
| Eat 5 servings of F&V daily      | Ref     | 1.31*      | 1.02-1.69 | 1.36* | 1.03-1.78 | 1.24       | .97-1.59  | 1.11  | .91-1.36 |
| ≤ 2 hours of daily screen time   | Ref     | .83*       | .70-.98   | .75*  | .57-.98   | .90        | .68-1.21  | .66** | .53-.81  |
| ≥ 1 hour of daily PA             | Ref     | .84        | .63-1.13  | .51** | .39-.68   | .85        | .71-1.02  | .61** | .51-.74  |
| 0 daily sugar-sweetened beverage | Ref     | .92        | .79-1.09  | .79   | .60-1.04  | .89        | .75-1.06  | .90   | .73-1.11 |

Model adjusts for grade and ethnicity

<sup>φ</sup>Adjusts for past 30-day use of e-cigarettes, cigars, cigarillos, smokeless tobacco

<sup>†</sup>Adjusts for past 30-day use of combustible cigarette use, cigars, cigarillos, smokeless tobacco

<sup>‡</sup>Excludes those who did not have sex during the past 3 months

\* p<0.05 \*\*p<0.01

Table 2 shows results from the regression analyses, stratified by sex, to determine sex-differences in health risk behaviors associated weight status among US youth. Females and substance use: Compared to normal weight females, overweight females were more likely to report current marijuana use (aOR=1.25, 95%CI=1.04-1.51, p=0.02 and aOR=1.33, 95%CI=1.06-1.67, p=0.01

Compared to normal weight females, both overweight and obese females were more likely to consume 5 servings of fruits and vegetables daily (aOR=1.31, 95% CI=1.02-1.69, p=0.03 and aOR=1.36, 95%CI=1.03-1.78, p=0.03 respectively) and less likely to meet the ≤2 hours daily screen time recommendation (aOR=0.83, 95% CI=0.70-0.98, p=0.04 and aOR=0.75, 95% CI=0.57-0.98, p=0.04) respectively. Obese females were also less likely to meet the ≥ 1 hour or more of physical activity recommendation (OR=0.51, 95% CI=0.39-0.68, p<0.01).

Males and substance use: There were no statistically significant associations between weight status and substance use among males. Males and sexual behaviors: Compared to normal weight adolescents, overweight males were more likely to report current sexual activity (OR=1.31, 95%CI=1.02-1.69, p=0.04). Males and 5-2-1-0 recommendations: Compared to normal weight males, obese males were less likely to meet ≤2 hours daily screen time (OR=0.66, 95% CI=0.53-0.81, p=0.00) and ≥ 1 hour or more of physical activity (OR=0.61, 95% CI=0.51-0.74, p<0.01) recommendations.

## Discussion

The aim of this research is to measure to what degree overweight and obese adolescents engage in health risk behaviors. Furthermore, the 5-2-1-0 recommendations were used as a guide to determine which adolescents were meeting nutrition and exercise requirements. Findings

respectively). Obese females were also more likely to smoke cigarettes (aOR=1.72, 95% CI=1.10-2.69, p=0.02) and drink alcohol (aOR=1.03, 95% CI=.83-1.28, p=0.01). Females and sexual behaviors: Compared to normal weight adolescents, overweight female adolescents were less likely to report current sexual activity (OR=0.70, 95%CI=0.60-.091, p=0.01).

showed that overweight and obese adolescents are more likely to participate in health-risking behaviors than normal weight adolescents, and that there are sex differences in the health risk behaviors overweight and obese adolescents are at risk. These findings are similar to previous research which consistently show prevalent health risk behaviors among overweight and obese adolescents (Boden et al., 2011; Lanza et al., 2017; Xu et al., 2018).

Male adolescents were more likely to report cigarette (9.4%) and e-cigarette use (15.1%) compared to female adolescents. This supports previous studies that have demonstrated that males are more likely to participate in cigarette and e-cigarette use (Atikah et al., 2019; Conner et al., 2019). Early onset of smoking has been found to continue into adulthood as evidence shows most current adult smokers began smoking as adolescents (Atikah et al., 2019; Jacobs, Bartoszek, & Unger, 2019) Given ample evidence demonstrating that obesity/overweight and smoking causes multiple health risks, there should be more prevention programs, particularly for these at-risk students, to target smoking prevention during adolescence.

Compared to male adolescents, female adolescents are more likely to report current alcohol use (32.0% vs. 26.3%). This finding suggests sex differences in health risk behaviors among adolescents. Specifically, female overweight and obese adolescents are more likely to engage in frequent drinking than their normal weight counterparts (Farhat et al., 2010). Furthermore, it used to be that males reported higher alcohol consumption, but this study found

that females were more likely to report drinking and getting drunk (Nutting, 2020; White, 2020). This finding is problematic and demands attention as increased alcohol consumption among females has both short (e.g., higher stress and anxiety) and long-term (e.g., faster advancement of liver disease) health effects (McCaul, Hutton, Stephens, Xu, & Wand, 2017; White, 2020).

This study also found that obese females were less likely to be currently sexually active while overweight males were more likely. Hence, while weight status was a protective factor for females, it was a risk factor for males. This finding highlights the potential weight stigmatization that females who are not in the normal weight category face which males do not encounter. The period of adolescence is crucial for emotional and social maturity and a period where adolescents develop sexually. While early sexual debut poses several adverse health outcomes, the finding that only overweight males were at risk while obese females were not, suggests that males who look a certain way could be considered sexually mature and attractive by their peers while females who are obese and considered unattractive. This possible weight stigmatization could have psychological and social impacts which may negatively affect the development of overweight/obese adolescents (Jacobs et al., 2020b). This finding highlights the role weight plays in social interactions and the need for comprehensive sexual education programs aimed at educating adolescents and changing the social norm surrounding self-esteem and body positivity (Akers et al., 2009; Leech & Dias, 2012).

The 5-2-1-0 recommendation is an obesity prevention guideline designed to succinctly summarize the behaviors necessary to prevent obesity. Less than 1% of the total sample met all four recommendations. In general, this study adds to evidence suggesting U.S. adolescents are currently sexually active while being an obese female reduced the odds of being sexually active. Although overweight and obese females were more likely to eat 5 servings of fruits and vegetables, in general adolescents are still lacking in engaging in obesity prevention behaviors. New comprehensive prevention programs and sexual education targeting adolescents should be implemented so that they are better educated about partaking in risk

unhealthy (Kinard & Webster, 2012). As expected, compared to normal weight adolescents, overweight and obese adolescents were less likely to meet the 5-2-1-0 recommendations. The analysis by sex reviewed that overweight and obese females were more likely to eat at least 5 servings of fruits and vegetables daily, however, they were less likely to meet other recommendations. Males had a similar pattern with obese males being less likely to meet the screen time and physical activity recommendation. There is need for more collaborative efforts to address the complex and problematic obesogenic behaviors adolescents engage in. This finding suggests that adolescents engage in both health-risking and health-protecting behaviors and efforts are needed to develop comprehensive programs able to address this complex interplay of behaviors among adolescents.

### Limitations and Conclusion

The findings from this study should be interpreted in light of some limitations. First, this was a cross-sectional study and therefore causality cannot be established. Furthermore, the YRBS data does not assess contextual factors such as socioeconomic status which has been found to be linked to substance use and dietary habits. Lastly, although the YRBS demonstrated good reliability and is shown to be representative of all youth aged 16–17 years in the U.S., the survey includes only youth in public or private high schools (Underwood et al., 2020). Therefore, findings may not be representative of out-of-school youth who are more likely than youth attending school to engage in health risk behaviors (Brener et al., 2013). Despite these limitations, this study found that obese females were most at risk for substance use (alcohol, cigarette, and marijuana use) compared to their counterparts. Being an overweight male was associated with and increased likelihood for being

### Acknowledgements

I would like to give a special thank you to my mentor, Dr. Wura Jacobs who has guided me throughout this project. I would also like to thank the McNair Scholars Program and staff for providing guidance and funding for my res

### References

- [1] Akers, A. Y., Lynch, C. P., Gold, M. A., Chang, J. C.-C., Doswell, W., Wiesenfeld, H. C., . . . Bost, J. (2009). Exploring the relationship among weight, race, and sexual behaviors among girls. *Pediatrics*, 124(5), e913-e920.
- [2] Amuta, A. O., Jacobs, W., & Barry, A. E. (2017). An examination of family, healthcare professionals, and peer advice on physical activity behaviors among adolescents at high risk for type 2 diabetes. *Health communication*, 32(7), 857-863.
- [3] Atikah, A. N., Wee, L. H., Zakiah, M. N., Chan, C. M. H., Haniki, N.M., Swinderjit, J., & Siau, C. S. (2019). Factors associated with different smoking statuses among Malaysian adolescent smokers: a cross-sectional study. *BMC public health*, 19(4), 1-8.
- [4] Boden, J. M., Fergusson, D. M., & FRSNZ, F. H. (2011). The short and

long-term consequences of adolescent alcohol use. *Young People and Alcohol*, 16, 32-46.

- [5] Brener, N. D., Kann, L., Shanklin, S., Kinchen, S., Eaton, D. K., Hawkins, J. & Flint, K. H. (2013). Methodology of the youth risk behavior surveillance system—2013. *Morbidity and Mortality Weekly Report: Recommendations and Reports*, 62(1), 1-20.
- [6] Committee, P. A. G. A. (2008). Physical activity guidelines advisory committee report, 2008. Washington, DC: US Department of Health and Human Services, 2008, A1-H14.
- [7] Committee, U. S. D. G. A. (2010). Dietary guidelines for Americans, 2010: US Department of Health and Human Services, US Department of Agriculture.
- [8] Conner, M., Grogan, S., Simms-Ellis, R., Scholtens, K., Sykes-Muskett, B., Cowap, L., . . . Schmitt, L. (2019). Patterns and predictors of e-cigarette, cigarette and dual use uptake in UK adolescents: evidence from a 24-month prospective study. *Addiction*, 114(11), 2048-2055.

- [9] Dhariwal, M., Rasmussen, M., & Holstein, B. E. (2010). Body mass index and smoking: cross-sectional study of a representative sample of adolescents in Denmark. *International Journal of Public Health*, 55(4), 307-314.
- [10] Farhat, T., Iannotti, R. J., & Simons-Morton, B. G. (2010). Overweight, obesity, youth, and health-risk behaviors. *American journal of preventive medicine*, 38(3), 258-267.
- [11] Farokhnia, M., McDiarmid, G. R., Newmeyer, M. N., Munjal, V., Abulseoud, O. A., Huestis, M. A., & Leggio, L. (2020). Effects of oral, smoked, and vaporized cannabis on endocrine pathways related to appetite and metabolism: a randomized, double-blind, placebo-controlled, human laboratory study. *Translational psychiatry*, 10(1), 1-11.
- [12] Hales, C. M., Carroll, M. D., Fryar, C. D., & Ogden, C. L. (2017). Prevalence of obesity among adults and youth: United States, 2015–2016.
- [13] Haughton, C. F., Wang, M. L., & Lemon, S. C. (2016). Racial/ethnic disparities in meeting 5-2-1-0 recommendations among children and adolescents in the United States. *The Journal of pediatrics*, 175, 188-194. e181.
- [14] Health, U. D. o., & Services, H. (2008). *physical activity guidelines for Americans*. Washington, DC: US Department of Health and Human Services; 2008. Essential resource from the Department of Health and Human Services with comprehensive physical activity guidelines to promote health.
- [15] Jacobs, W., Bartoszek, L., & Unger, J. (2019). Using the Theory of Triadic Influence to Examine Correlates of Positive Drug Expectancies Among Hispanic Adolescents. *Health Behavior Research*, 2(4), 9.
- [16] Jacobs, W., Merianos, A. L., Smith, M. L., Nabors, L., Fajayan, A., & Valente, T. W. (2020a). Examining the Role of Weight Status and Individual Attributes on Adolescent Social Relations. *Journal of Adolescent Health*.
- [17] Jacobs, W., Merianos, A. L., Smith, M. L., Nabors, L., Fajayan, A., & Valente, T. W. (2020b). Examining the Role of Weight Status and Individual Attributes on Adolescent Social Relations. *Journal of Adolescent Health*, 67(1), 108-114.
- [18] Kann, L., Olsen, E. O. M., McManus, T., Harris, W. A., Shanklin, S. L., Flint, K. H., . . . Whittle, L. (2016). Sexual identity, sex of sexual contacts, and health-related behaviors among students in grades 9–12—United States and selected sites, 2015. *Morbidity and Mortality Weekly Report: Surveillance Summaries*, 65(9), 1-202.
- [19] Kate, B. (2017). Estimating how extra calories from alcohol consumption are likely an overlooked contributor to youth obesity. *Health promotion and chronic disease prevention in Canada: research, policy and practice*, 37(6), 194.
- [20] Khalsa, A. S., Kharofa, R., Ollberding, N. J., Bishop, L., & Copeland, K. A. (2017). Attainment of ‘5-2-1-0’ obesity recommendations in preschool-aged children. *Preventive medicine reports*, 8, 79-87.
- [21] Kinard, B. R., & Webster, C. (2012). Factors influencing unhealthy eating behaviour in US adolescents. *International Journal of Consumer Studies*, 36(1), 23-29.
- [22] Lanza, H. I., Pittman, P., & Batshoun, J. (2017). Obesity and cigarette smoking: Extending the link to e-cigarette/vaping use. *American journal of health behavior*, 41(3), 338-347.
- [23] Leech, T. G., & Dias, J. J. (2012). Risky sexual behavior: a race-specific social consequence of obesity. *Journal of youth and adolescence*, 41(1), 41-52.
- [24] Li, J., Yang, C., Davey-Rothwell, M., & Latkin, C. (2016). Associations between body weight status and substance use among African American women in Baltimore, Maryland: The CHAT study. *Substance use & misuse*, 51(6), 669-681.
- [25] McCaul, M. E., Hutton, H. E., Stephens, M. A. C., Xu, X., & Wand, G. S. (2017). Anxiety, anxiety sensitivity, and perceived stress as predictors of recent drinking, alcohol craving, and social stress response in heavy drinkers. *Alcoholism: Clinical and Experimental Research*, 41(4), 836-845.
- [26] Nutting, A. W. (2020). Height and Adult Alcohol Consumption. *Atlantic Economic Journal*, 48(1), 115-129.
- [27] Reilly, J. J., & Kelly, J. (2011). Long-term impact of overweight and obesity in childhood and adolescence on morbidity and premature mortality in adulthood: systematic review. *International journal of obesity*, 35(7), 891-898.
- [28] Rogers, V. W., Hart, P. H., Motyka, E., Rines, E. N., Vine, J., & Deatrick, D. A. (2013). Impact of let’s go! 5-2-1-0: a community-based, multisetting childhood obesity prevention program. *Journal of pediatric psychology*, 38(9), 1010-1020.
- [29] Sansone, R. A., & Sansone, L. A. (2013). Obesity and substance misuse: is there a relationship? *Innovations in clinical neuroscience*, 10(9-10), 30.
- [30] Schneider, A. C., Zhang, D., & Xiao, Q. (2020). Adolescent sleep characteristics and body-mass index in the Family Life, Activity, Sun, Health, and Eating (FLASHE) Study. *Scientific Reports*, 10(1), 1-10.
- [31] U.S. Department of Health and Human Services, C. f. D. C. a. P. Youth Risk Behavior Surveillance System (YRBSS). Retrieved from <https://www.cdc.gov/healthyyouth/data/yrbs/index.htm>
- [32] Underwood, J. M., Brener, N., Thornton, J., Harris, W. A., Bryan, L. N., Shanklin, S. L., . . . Chyen, D. (2020). Overview and methods for the Youth Risk Behavior Surveillance System—United States, 2019. *MMWR supplements*, 69(1), 1.
- [33] US Department of Health and Human Services, O. o. D. P. a. H. P. Healthy People 2020. Retrieved from <http://www.healthypeople.gov/2020>
- [34] Webster, E. K., & Staiano, A. E. (2020). Extended Heavy Television Viewing May Impact Weight Long Term in Adolescents. *Journal of Adolescent Health*, 66(5), 517-519.
- [35] White, A. M. (2020). Gender differences in the epidemiology of alcohol use and related harms in the United States. *Alcohol research: current reviews*, 40(2).
- [36] Xu, L., Jacobs, W., Church, T., Ning, L., & Lu, W. (2018). Factors Influencing Family Health History Discussions between College Students and Healthcare Providers. *Health Behavior and Policy Review*, 5(2), 12-22.



# Human Dignity v Civil Liberties: How Israeli and American Supreme Courts Handle Hate Speech

Zephan Wood

*B.A. Candidate, Department of Political Science, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

Received 16 April 2021; accepted 20 July 2021

---

## Abstract

The purpose of my research is to compare and contrast how hate speech is treated by the Supreme Courts in two separate countries, the United States and Israel. These countries utilize different methods of review, in the United States, the strict scrutiny standard of upholding civil liberties such as free speech is upheld, while in Israel, the human dignity standard is upheld. This is significant because how the state treats hate speech has an impact on the societal landscape. When a nation imposes speech restrictions on its populace, it can have the ripple effect of determining the behavior of the citizens that commonly engage in speech, sometimes with unintended and/or intended malicious consequences.

---

## Human Dignity vs Strict Scrutiny

As political tensions continue to rise all over the world, nation-states are trying to find a solution for inflammatory rhetoric gauged towards fellow citizens. In Western nations, these have been legal battles fought on their respective Supreme Courts utilizing the legal frameworks and foundational documents that fuel their legal process. Legislators and courts have implemented measures restricting “hate speech” which Merriam-Webster defines as “speech expressing hatred of a particular group of people.” with hatred defined as “extreme dislike or disgust.” Historically, the United States Supreme Court has intrinsically valued the classical liberal value of free speech and expression that allows the uninhibited expression of all civilians, as long as the speech does not indicate an imminent direct threat to others. This is referred to generally as the civil liberties approach to speech. This would include protections on so called hate speech as long as it conformed to this value.

This was most clearly laid out in the case of *Brandenburg v Ohio* in which a two-pronged test was developed by the Court to encompass the acceptable restrictions on speech. First, speech is able to be restricted if it is “directed at inciting or producing imminent lawless action” and, secondly, it is “likely to incite or produce such action.” In other words, speech could be restricted if it encouraged people to violate the law, if the speech would actually be effective in doing so, and if the intention behind the speech giver indicates that he wants others to engage in said unlawful action. While the *Brandenburg* standard may, on its surface, seem clearly defined with a low likelihood for misinterpretation, however, the Court has needed to constantly revisit and reapply this standard in different circumstances. In doing so, they utilize the strict scrutiny standard of review which seeks to determine if a government regulation that impedes speech is narrowly tailored enough to serve a compelling government interest. This is done to demonstrate the reverence in which free speech protections are entitled to in the United States. However, not all nations conform to this level of protection for speech protections or invoke the same level of scrutiny for notions of free speech and free expression.

Instead, they revert to the standard of human dignity which can be defined as “An individual or group’s sense of self-respect and self-worth, physical and psychological integrity and empowerment.”<sup>2</sup> This standard could be used to restrict speech if it violates an individual’s or group’s sense of self. For example, in Germany the Federal Constitution permits the restriction of speech if it results in “disturb(ing) the public peace in a manner that violates the dignity of the victims (of the Nazi regime) by approving of, glorifying, or justifying the National Socialist rule of arbitrary force.”<sup>3</sup> This restricts the promotion of Nazi works such as Hitler’s *Mein Kampf*, political speeches of Nazi leaders, and anything else that may inhibit the human dignity of the victims of the National Socialist party. While this may seem reasonable on its face, the civil libertarian judge may argue that this has the result of chilling speech and the restriction of vital debates that must be had on the public level, but more on that later.

The United States has been unique in developing these protections for speech as more Western nations have opted for the human dignity approach of judicial review such as Germany, Canada, and of course, Israel. One of the most interesting shifts has been that of Israel, which started as a nation that utilized civil liberties as its starting point of judicial review in regards to speech, but slowly shifted to the human dignity as time went on. Israel serves as a prime example of a dynamic judicial system that has a unique and complex history on how it treats hate speech and which standards should be utilized in reviewing hate speech. Conversely, the U.S. has continued to offer robust defenses of free speech, opting to allow public discourse to handle issues of hate speech rather than the courts.

The purpose of this piece is to demonstrate the historical development of these standards of review in the U.S. and in Israel, including the cases that have shaped the jurisprudence of these two legal systems, to see how these rulings have affected minority rights in the respective nations, and why this is an important question to be asking. First, in order to fully answer these questions, one must grasp a well-rounded understanding of the structure of these legal institutions.

## **The Structure of Israeli and American Supreme Courts**

The United States has a judicial system with a complex number of different courts, including but not limited to tax courts, administrative law courts, veterans' courts, and more. Additionally, the United States has two distinct systems of courts, a federal system and 50 state courts. For the sake of simplicity, there are three major ascending types of courts. The lowest level is the district courts, of which there are currently 94 of them. They, like all other courts, apply the facts to the laws at play in any given case. This is the classical courtroom that is generally displayed in TV shows in which a jury decides the outcome of the case. There is at least one in each state and they have the power to impose sanctions on individuals that are deemed to have violated the law. If the defendant would like to appeal a decision, they can take their case to the next level, the Court of Appeals, of which there are currently 13. This consists of three judges, without a jury, that review the facts of the legal considerations of a case. For example, the Court sees if evidence utilized was admissible or if the issue at hand was constitutional. If the decision is the same and the defendant would like to appeal again, then they can request to have their case reviewed by the Supreme Court. However, generally the Court only takes cases that seek to rectify a constitutional issue that has not been fully scrutinized or that is demanding given the current political climate (i.e. *Bush v Gore*). Hence, while the Court has the ability to uphold or reverse lower court decisions, the Court's primary function is to rule the constitutionality of any given action. This power of judicial review was decided in the landmark case of *Marbury v Madison*. Justices are chosen by the President and approved by the Senate, currently, nine justices occupy the Supreme Court with one Chief Justice. The Supreme Court is a unique branch of the federal government in that the justices serve lifetime appointments in addition to being unelected. This is designed to insulate them from external political influences so they could exclusively focus on ruling on the constitutionality of a case.

In regards to the Israeli judicial system, it is similar to the U.S. system in that it also has a multitude of courts, including but not limited to, labor courts, military courts, immigration courts, and more. All Israeli courts are national in nature since it is such a small country. Additionally, their legal system can be broken down utilizing three ascending levels as well. The bottom level would be the magistrate court, this level is limited in their scope of what issues they can rule on. For example, the magistrate court can only rule in criminal cases on matters where the offense is less than seven years in prison. In civil court, they only rule on matters in which the dispute is less than 1 million shekels (or \$300,000). These cases are usually decided by one judge with no jury, but sometimes three judges are assigned to one case depending on the circumstance. There are currently 29 magistrate courts in Israel. The next level is the District Courts, these courts handle criminal cases in which the offense could result in more than seven years in prison or in which the civil penalties exceed 1 million shekels. These cases are

conducted by a panel of three judges that rule on a case. There are five District Courts in Israel. The highest court in Israel is the Israeli Supreme Court. All civil and criminal cases on either level are appealable to be heard on the Supreme Court level, regardless of their effect on constitutionality. The Israeli Supreme Court, like the SCOTUS, also has the ability of judicial review with their official title being the High Court of Justice. The ability to engage in judicial review was solidified in the case *United Mizrahi Bank v. Migdal Cooperative Village* (1995). This entails the ability to review the other branches of government to uphold its duty of preserving the rule of law and strengthening human rights. These justices are nominated by the Judicial Selection Committee and then appointed by the President, currently there are 15 justices on the high court with the President of the Court being the equivalent of the Chief Justice. While these justices are only allowed to serve until 70 or until they resign, this system still would, in theory, insulate the justices from outside political forces that would dramatically affect their decisions and should strengthen the impartial nature of the judicial branch.

## **The Development of the Strict Scrutiny Standard on the U.S. Supreme Court**

### *The First US Cases that Dealt with Hateful Speech*

The United States Supreme Court has had a rich collection of rulings in regard to offensive speech. While the issues of offensive speech or hate speech are not necessarily new, the articulation on how they should be handled in a legal context has been most expanded upon during more contemporaneous times. One of the first cases to handle the issue of offensive speech was the case of *Chaplinsky v New Hampshire*. While Walter Chaplinsky was handing out religious literature, he called the town marshal a "God-damned racketeer" and "a damned Fascist." He was arrested in violation of a law that banned intentionally "offensive, derisive, or annoying speech." Chaplinsky argued that this law was overly vague and appealed all the way to the Supreme Court in 1942. In a unanimous decision, the court held that "fighting words" could be prosecuted. The Court's rationale was that fighting words had no social value (i.e. they did not convey any ideas of political, social, religious, etc. significance) and they had the potential to cause a breach of the peace. Therefore, the state is justified in curbing speech that can be considered "fighting words" if doing so would uphold order and peace within a society and only restrict speech with no redeemable social value. This, known as the fighting words doctrine, was how the Freedom of Speech clause in the First Amendment was interpreted for another quarter of a century.

This doctrine was expanded upon to address hate speech specifically in the case of *Beauharnais v. Illinois* (1952). In this case, Joseph Beauharnais was convicted for distributing leaflets that called on fellow white citizens and the Chicago government to cease the alleged violence that African American citizens were committing against Caucasian Americans. The justification for the punishment was that there was a state law that banned the libelous speech against other races, colors, creeds, or religions if

that speech was likely to breach the peace. When this case reached the Supreme Court, the decision was much closer than in *Chaplinsky*. With a 5-4 decision, the Court ruled that Beauharnais did engage in libel speech and that the 1st Amendment does not protect libelous speech. Essentially, the Court tied libelous speech to that of fighting words in that Beauharnais' inflammatory speech could result in a violent outbreak of people that are provoked by what he says. However, in a dissenting opinion, Justice Black and Douglas asserted that society, and the individuals that inhabit that society are better suited to determine what issues should be discussed in the public square and that the government should play a minimal role in making such a determination.

#### *The Important Case of Brandenburg v Ohio*

This developing standard radically changed with the aforementioned case of *Brandenburg v Ohio*. In this case, Clarence Brandenburg, a leader of a KKK chapter in Ohio argued in a speech that "revengeance" [sic] should be taken against black people and Jews as well as the people that supported them, including the members of government that "continue to suppress the white, Caucasian race." During that speech, there were armed KKK members present. Brandenburg was arrested under a law that made it illegal to advocate terrorist methods as a means of achieving political ends. Specifically, the law punished "criminal syndicalism" which can be defined as engaging in criminal acts to achieve social, political, and/or industrial change. As the other case mentioned, Brandenburg took his case all the way to the Supreme Court and received a unanimous decision. However, unlike *Chaplinsky v New Hampshire*, the Court ruled that this law violated Brandenburg's 1st Amendment right. While the fighting words doctrine still remains unchallenged, this case enshrined the Brandenburg test as the gold standard on which strict scrutiny would rest upon. When the Court utilizes strict scrutiny, and ergo the Brandenburg test, the Court is looking for two things. First, they are looking to see if there is a compelling interest that the government seeks to fulfill in restricting that speech. Second, they ensure that it is done utilizing the least restrictive means, meaning that it is content neutral and does not chill speech unnecessarily. Additionally, in order to pass the Brandenburg test, the speech must be "directed at inciting or producing imminent lawless action" and is "likely to incite or produce such action". For example, hypothetically Brandenburg could have been punished if he was standing outside of a synagogue with a mob possessing arms and he was directing the angry, clearly violent mob to attack the synagogue and, importantly, if the intention behind making that speech was to incite that violent action to occur. If the speech being sanctioned does not meet these criteria established in the Brandenburg test, then the state is being overly vague in its regulation and is exceeding its constitutional limits. This doctrine uprooted the clear and present danger test established in cases such as *Schenck v United States* and *Abrams v United States* to name a few, which asserted that speech could be regulated if it posed a clear and present danger to others. This was used to justify restricting speech that criticized the draft, as was the case in *Schenck* among other regulations.

#### **Cases that Expanded and Modified the *Brandenburg* Test**

The hate speech component of the Brandenburg test was expanded in a plethora of cases, starting with the case of *R.A.V. v City of Paint Paul*. In this case, some teenagers burned a cross on a black family's lawn and were punished under a law which banned objects that "arouses anger, alarm or resentment in others on the basis of race, color, creed, religion or gender." This was appealed to the Supreme Court. This action may be viewed by some as an adherence to the law in the most elementary sense, in that these people did commit acts of imminent lawless action and encourage others to do so, thus seemingly complying to the Brandenburg test. However, the Court argued that since this speech was regulated based on the content of the speech, because the government disapproved of the content, the Court ruled this law moot and struck it down. This case was monumentally vital in establishing the precedent for how hate speech should be regulated. Essentially, if the government wanted to legally regulate hate speech, it would need to do so in a way that was content neutral and utilized the least restrictive means in achieving their stated goal. In this case, the standard was too broad since the law prohibited anything that aroused anger, alarm, or resentment on the basis of protected factors. Depending on the circumstance, this could restrict most political speech. For example, if someone is criticizing Islam as an ideology, a religious person could invoke this law and silence the criticizer. Additionally, this allows for the heckler's veto, in which the side that claims the most offense is the side that will ultimately win. As the Court stated in this case, the government has no authority "to license one side of a debate to fight freestyle, while requiring the other to follow the Marquis of Queensbury Rules." In other words, the government has no place in picking winners and losers in societal debates, those debates need to be held exclusively in the social realm separate from the state. In doing this, the Court continued to establish the importance of allowing the "free marketplace of ideas", as John Stuart Mill described it, to take root in discussions on social topics instead of allowing the government to guide the conversation one way or the other.

A case that further expanded on this was that of *Virginia v Black* which also dealt with cross burnings. In this case, Barry Black violated a Virginia law that prohibited "any person..., with the intent of intimidating any person or group..., to burn...a cross on the property of another, a highway or other public place," and that "any such burning...shall be prima facie evidence of an intent to intimidate a person or group". Black challenged this with the prior 1st Amendment protections laid out in the prior case in mind. However, to his dismay, the Court ruled in a 7-2 decision in favor of Virginia, utilizing the strict scrutiny rationale. The distinction in this case was the intent to intimidate. The Court argued that while it is constitutional to create laws that prohibit the intent to intimidate another person or group, as long as they are neutral and use the least restrictive means, it disagreed that

cross burning is prima facie evidence of the intent to intimidate. Therefore, the law was unconstitutional, but an important principle was upheld. Essentially, the government still does not have the ability to judge based on content, except for advocacy for illegal action, obscenity, libel, and fighting words, however, it does have a compelling interest in restricting speech or expression if the intent behind that speech is to threaten individuals or groups. The Court is clearly walking a fine line between protections of civil liberties and upholding a human dignity standard.

The case of *Snyder v Phelps* made that fine line less ambiguous. In this case, the Westboro Baptist Church protested a soldier's funeral and was sued by the family. The church argued that this violated their 1st Amendment right to freedom of religion and appealed to the Supreme Court. In an 8-1 decision, the Court ruled in favor of the Westboro Baptists. The Court asserted that the 1st Amendment protects those that protest funerals from retribution. One could argue that the Westboro Baptist Church's protest could have been staged as intimidation against the family and other families who serve in the military. However, in utilizing strict scrutiny the Court found that the intention behind the Westboro Baptist Church was unclear and certainly could not be proven to be intimidation. Additionally, Snyder was suing for the emotional damage inflicted on the family of the soldier. On this point, the Court ruled that mere emotional damage is not enough to justify sanctions against another individual. If that were allowed to happen, then any speech that disrupted the emotional sensibilities of a person that was unfavorable would be permitted to become prohibited. To reiterate, the Court established protections of hate speech that 1) Did not violate the Brandenburg Test, meaning that a) it did not incite imminent lawless action and b) it was not likely to cause such action and 2) adhered to strict scrutiny meaning that a) the government regulation was content neutral in nature and broadly applicable and b) that the regulation utilized the least restrictive means in achieving its goal and 3) that intimidation could be a relevant factor but only if that intimidation could be clearly proved.

### **The Development of the Human Dignity Standard on the Israeli Supreme Court**

#### *The Important Case of Kol Ha'am v Ministry of Interior*

Unlike the United States, which relied on the development of a coherent standard based in a system of laws that extended back hundreds of years, the Israeli Supreme Court has little legal documentation to draw from to justify either free speech or human dignity. In fact, in Israel's inception, the laws regarding the basic functions of the state were passed after those institutions had already been functioning. To this day, Israel still does not have a written Constitution.<sup>1</sup> However, the Court contemporaneous draws from the Basic Law: Human Dignity and Liberty, passed on March 17th 1992, to render legal decisions that pertain to human rights. The passage of this legislation is commonly referred to as the Constitutional Revolution. Additionally, the Israeli Supreme Court frequently draws from the decisions of other nations, especially in the United States. Cases in

which the United States is the primary mode of reference, the classical liberal view of civil liberties tends to be upheld, whereas when other countries are referenced or if Israel asserts independent review then human dignity is upheld.

Prior to the Constitutional Revolution of the 1990s, the way that Israeli justices would rule would be left to their individual discretion and to serve as a check against the other branches when they would violate the rights of Israeli citizens. The beginning of what is considered to be the "golden era" of speech protections in Israel was established in the case of *Kol Ha'am v Ministry of Interior* in 1953. In this case, the government halted the publication of Kol Ha'am newspaper because it was posting material that was critical of the government's foreign policy. This case was appealed to the Israeli Supreme Court and the government sanction was subsequently struck down. In the decision, Justice Agranat, Sussman, and Landau argued that the Court had to define, "the relationship that exists between the right to freedom of the press on one hand, and on the other, the power held by the authorities... to place a limit on the use of that right." Freedom of expression, speech and press are vital to Israeli society since it is "closely bound up with the democratic process." This means that these protections are of great importance to the vibrancy of Israeli democracy and to restrict speech in such a matter would have the effect on chilling speech, inhibiting people from fully taking part in said democracy. However, the government does have the ability to "prohibit incitement calculated to result in the immediate injury to life, limb or property of another." This has striking similarities to the standard laid out in *Schenek v United States* in the American Supreme Court in which it is asserted that there must be a clear and present danger that the speech poses to an individual. Moreover, it goes a step farther than the *Schenek* decision in that it grants extra protections for the state. The state simply needs to "balance" the value of freedom of speech on one hand and the ability of the authorities to restrict that right in order to maintain public order. The Kol Ha'am standard persisted throughout the 70s and 80s up until the Constitutional Revolution in 1992.

### **Modification of the Kol Ha'am Standard After the Passage of the Basic Law**

Following the passage of the Basic Law: Human Dignity and Liberty, human dignity played a key role in guiding Supreme Court decisions and completely shifting the frame of reference from judicial activism in favor of civil liberties to judicial activism in favor of human dignity. The structuring of the Basic Law may have been responsible for that shift. In drafting the bill, the members of the Knesset intentionally did not mention protections for freedom of speech, press, or expression, but instead, focused more on positive rights. Negative rights entail that the government refrain from imposing restrictions that could potentially infringe on individual liberty while positive rights entail the government taking a more active role in providing the citizenry with either a good or a service deemed to be a right. This debate over the role of government is at the heart of the debate of civil liberties vs

human dignity in judicial review. This means that the Israeli government would play a much more pronounced role in intervening in social interactions than the prior laissez-faire government. Additionally, in areas in which the Basic Law did protect negative rights, they were much less clearly defined and abstract than the positive rights. This has the potential to lead to a more pronounced judicial preference for positive rights such as human dignity since the Court is able to extract and develop a clear set of guidelines based off of the legislation.

This monumental change did not directly shift the standard that the Court utilized for some time. In fact, following the passage of the Basic Law, it took about a decade for the Court to assert jurisdiction over this new framework. In 2003, the Court heard the case of *Herut-The National Jewish Movement v. Cheshin*. In this case, the petitioner asserted that an election commercial be allowed to be broadcast over radio and television in which Yasir Arafat was praised and called for the expulsion of Jews from Jaffa and Ramle. The Elections Committee disqualified this commercial stating that it would violate the dignity of the flag as well as Israeli sovereignty. As mentioned, the Court explicitly asserted jurisdiction over this matter and stated that they retain jurisdiction when any violation of the 12 Basic Laws takes place. However, for this case, the *Kol Ha'am* standard was still utilized. The Court upheld the actions of the Elections Committee, stating that they did uphold the values of freedom of speech and public safety. However, the President of the Court dissented stating that this balance was not reached.

#### **The Total Replacement of the *Kol Ha'am* Standard**

The full abandonment of the *Kol Ha'am* standard was realized in 2006 in two cases. The first case was *Shinui Party v Chairman of the Elections Committee* in which an infomercial was disqualified from publicly airing because it portrayed Orthodox Jews as parasites. This choice of portrayal was made by secular Jews to highlight the fact that secular Jews must subsidize the activities of Orthodox Jews through taxation. The Court ruled that this depiction was reminiscent of Nazi portrayals of Jews and deeply violated the human dignity of Orthodox Jews in violation of the second Basic Law of Human Dignity and Liberty. This is despite the fact that this speech was purely political in nature and did not have the intention to demean Jews in the way that Nazis had. Despite this, the Court upheld the ban due primarily to the offensive nature of the speech utilizing the justifications laid out in the Basic Laws. No longer balancing freedom of speech and maintaining public order, this was a dramatic shift from the *Kol Ha'am* standard to fully embracing the Human Dignity guidelines laid out in the Basic Laws.

A case that further expanded on these concepts was the case of *Dankner v Ben-Gvir*. In this case, Ben-Gvir sued Dankner stating that he had committed libelous acts against him by calling him a Nazi, despite the fact that this exchange happened between two Jews. The Court did rule that calling someone a Nazi was a libelous action. The Court was divided over this decision, stating that Ben-Gvir had engaged in utilizing Nazi terminology in the past, but the decision was upheld, and civil penalties were sanctioned against Dankner as a result. Once again, the

Court had engaged in taking part in public discourse in a way that censored purely or mostly political speech. This embrace of the Human Dignity standard at the expense of civil liberties had tremendous ramifications on societal, political, and religious discourse moving forward.

#### **Difference in Treatment of Hate Speech in Israel v U.S.**

It is clear that the United States and Israel have clear distinctions in regard to how hate speech is treated. In the United States, almost all speech is protected and is treated with strict scrutiny, meaning that the government must have a compelling interest to restrict that speech and the sanction must use the least restrictive means necessary to achieve that goal. Additionally, speech that is explicitly not allowed are advocacy for illegal action, obscenity, libel, and fighting words. This is done under the justification of the First Amendment, implemented on a Federal and State level, and under the judicial interpretation of that legislation in the aforementioned cases.

Conversely, Israel has the ability to restrict speech that violates any of the 12 Basic Laws. That includes, but is not limited to, purely political speech, speech critical of religion, inflammatory speech, and others, if the speech violates the individual or group identity of the plaintiff in question. This stands in stark contrast with the *Kol Ha'am* case which purported to value free speech and public order on nearly equal footing and realized the utility that free speech has to a vibrant democracy. This clear shift can be explained by a multitude of factors.

First, many Western nations, besides the United States, are adopting this as public policy and the normalization on the international stage has incentivized Israeli justices to conform with international norms. Secondly, these reforms have been disproportionately taking place in European countries. Increasingly, Israel has identified and aligned itself more and more as a European rather than a Middle Eastern nation. Israel has a substantial portion of European Jews that make up the body politic and routinely partakes in European cultural phenomena such as Eurovision. Along with complying with international norms, perhaps the justices also feel the need to align with European policy prescriptions as well. However, the most likely scenario is that the Israeli justices are looking at the political landscape of Israel and are taking precautionary measures to ensure that political unrest does not become commonplace. In addition to the clear divides in the nation between the secular population and religious population, the conflict with the Palestinians also plays a key part in the political and social dialogue. Perhaps the Israeli Supreme Court believes that in limiting the speech that divides the Israeli population and that potentially radicalizes the Palestinian population, Israel will see a more unified, secure nation as a result. For a nation that has experienced so many internal and external threats throughout her existence, the justices could hardly be at fault for taking this approach. However, the classical thinkers that drafted the First Amendment would disagree with this assessment. Proponents of free speech would argue that in restricting speech in such a broad and unrestrained fashion, the government becomes a threat to the individuals that it has pledged to serve and has limited

what sort of public discourse people feel comfortable to engage in. Furthermore, these sorts of restrictions could have the exact opposite effect of what was previously described. For example, the lack of discourse could inflame further divisions between the secular and religious segments of Israel which could result in further political fragmentation between the two groups with the potential for violence to ensue. If issues cannot be discussed, the only other means of redress to those issues to many is physical violence. This principle would hold true when it comes to the treatment/the reaction of the Palestinian population as well. In temporarily halting conflicts between these factions, the Israeli Supreme Court is allowing for these issues to boil under the surface until an eruption occurs. In the spirit of “protecting the nation” the Israeli Supreme Court could be sowing the seeds of its own destruction.

### Conclusion

Domestically, the issue of hate speech is still one of the hottest buttons and divisive issues facing the two nations. However, the judiciary in both nations is very much separated from elective politics and both have powerful precedents that will serve as an anchor for the current governmental treatment of hate speech. It is unlikely that the United States will overturn the precedent laid out in *Brandenburg* and no longer deem Freedom of Speech worthy of strict scrutiny. Similarly, Israeli institutions have converged around the Basic Laws and the likelihood that this will change in the near future is incredibly slim.

In short, restrictions on hate speech may be proposed in the United States through legislative and executive channels and promptly rendered moot by a vigilant Supreme Court. Conversely, Israel will likely continue to propose regulations on hate speech that will be upheld if not directly imposed by the Israeli Supreme Court. This will persist for at least the next half century as the principles of Freedom of Speech will continue to broaden or remain the same in the United States while speech in other nations that have embraced the Human Dignity standard, such as Israel, will continue to face further restrictions. This is just one way that the value divide between the United States and the rest of the West will continue to broaden. In other words, if this trend continues, the United States may be the last nation in the world that continues to allow hate speech to persist, and, in doing so, will remain the only nation to have a system that enshrines Freedom of Speech as a key value of the nation.

### References

- [1] Merriam-Webster. *Hate Speech*. Merriam-Webster. Retrieved from <<https://www.merriam-webster.com/dictionary/hate%20speech>>. Retrieved on 04 May 2021.
- [2] Merriam-Webster. *Hatred*. Merriam-Webster. Retrieved from <[https://www.merriam-webster.com/dictionary/hatred?pronunciation&lang=en\\_us&dir=h&file=hatred01](https://www.merriam-webster.com/dictionary/hatred?pronunciation&lang=en_us&dir=h&file=hatred01)>. Retrieved on 04 May 2021.
- [3] Duhaime’s Law Dictionary. *Human Dignity Definition*.

- Duhaime’s Law Dictionary. Retrieved from <<http://www.duhaime.org/LegalDictionary/H/HumanDignity.aspx>>. Retrieved on 04 May 2021.
- [4] Library of Congress LAW. *Limits on Freedom of Expression: Germany*. Library of Congress LAW. Retrieved from <<http://www.duhaime.org/LegalDictionary/H/HumanDignity.aspx>>. Retrieved on 04 May 2021.

**Figures**

Figure 1

**U.S. Supreme Court Cases**

| <b>Case Name</b>                  | <b>Year</b> | <b>Holding Principle/How the Case Relates to Hate Speech</b>  |
|-----------------------------------|-------------|---|
| <i>Chaplinsky v New Hampshire</i> | 1942        | Held that “fighting words” can be sanctioned to maintain public order. Fighting words are described as advocating an “imminent breach of the peace”, it can be argued hate speech meets this category as well. This standard has never been explicitly overturned.                              |
| <i>Beauharnais v Illinois</i>     | 1952        | Distributing potentially racist material is tantamount to libel and is not constitutionally protected. Under this standard, hate speech is subject to direct sanctions via the state.   |
| <i>Brandenburg v Ohio</i>         | 1969        | Created the primary guiding star in relation to constitutionally permissible hate speech regulations. In order for speech to be regulated it must be (1) “directed at inciting or producing imminent lawless action” and (2) “is likely to incite or produce such action.”                      |
| <i>R.A.V. v City of St. Paul</i>  | 1992        | Held that government regulations in relation to hate speech must be content neutral. Government regulations that abide by the <i>Brandenburg</i> standard cannot favor one side of a cultural/societal argument over another.   |
| <i>Virginia v Black</i>           | 2003        | Held that the intent to intimidate behind cross burning is enough to warrant constitutionally-permissible regulation. Relates to hate speech in that speech/expression that intends to intimidate is not necessarily constitutionally protected.  |
| <i>Snyder v Phelps</i>            | 2011        | Extends protection of “distasteful and repugnant...words” to circumstances pertaining to religious expression. Relates to hate speech in that it recognizes that the 1st Amendment protects religious protests, even if the protestors engage in incredibly hateful speech to make their point. |

Figure 2

**Israeli Supreme Court Cases**

| <b>Case Name</b>  | <b>Year</b> | <b>Holding Principle/How the Case Relates to Hate Speech</b>  |
|---|-------------|---|
| <i>Kol Ha'am v Ministry of the Interior</i>               | 1953        | Balanced the value of freedom of speech and the ability to restrict speech to maintain public order. This was the Israeli Supreme Court case that was the closest to the <i>Brandenburg</i> standard in the US.   |
| <i>Herut v Cheshin</i>                                    | 2003        | First case to invoke a violation of the Basic Law under human dignity but continued to utilize the <i>Kol Ha'am</i> standard stating that the balance between free speech and public order was maintained. Relates to hate speech in that the Court was inching closer to abandoning the <i>Kol Ha'am</i> standard in favor of the Court’s interpretation of the Basic Law. |
| <i>Shinui Party v Chairman of the Elections Committee</i> | 2006        | Exclusively relied on the Basic Law in this ruling, stating that the dignity of religious Jews was violated in a political ad, and the Court did not attempt to balance democratic values with maintaining public order. This highlighted a shifting emphasis from <i>Kol Ha'am</i> to greater regulation of hate speech, even if the speech is purely political.           |
| <i>Dankner v Ben-Gvir</i>                                 | 2006        | Similar to <i>Shinui</i> , the Israeli Supreme Court abandons the <i>Kol Ha'am</i> standard in favor of restricting political speech that violates the Basic Law. Similarly demonstrates a shift to a greater regulation of hate speech.  |

# Effects of Trait-Anxiety and Mindfulness on Female Sexual Functioning

Kerry Young

*B.A. Candidate, Department of Psychology, California State University Stanislaus, 1 University Circle, Turlock, CA 95382*

Received 16 April 2021; accepted 20 July 2021

---

## Abstract

My Capstone Project focuses on how trait-anxiety and mindfulness relate to female sexual functioning. I hypothesized that trait-anxiety would be positively related to sexual difficulties, and mindfulness would be negatively related to sexual difficulties. My study was conducted online using self-report measures. Eighty-nine participants were collected using SONA. Participants were sexually active females on Stan State's campus from ages 18-42. This study used three surveys: The Hospital Anxiety and Depression Scale, The Freiburg Mindfulness Inventory, and The Sexual Distress-Revised questionnaire. Using the responses from these surveys, I analyzed the relationships between mindfulness, sexual distress, and trait-anxiety. My results supported my hypothesis that women who report higher trait-anxiety report more sexual difficulties ( $r = .51$ , 95% CI [.31, .67]) and women who report higher mindfulness report fewer sexual difficulties ( $r = -.42$ , 95% CI [-.60, -.21]). This study is important because it brings light to a topic that has historically been underrepresented, it has potential for real world application, and it helps generalize findings to an understudied population.

*Keywords: Trait-anxiety, mindfulness, female sexual functioning*

---

## Introduction

Today, it is widely accepted that a healthy sex life is important to overall life satisfaction. However, society is still often hesitant to discuss sexuality and sexual health. As a result, many people may be unaware of the problems that they may encounter once becoming sexually active. People may feel a sense of shame in their sexual behavior due to the societal narrative that sex is a dirty or sinful act. Particularly in women, this shame may cause problems in their sex life, ranging from discomfort to physical pain. Within the last century researchers have started to more thoroughly investigate the link between anxiety and sexual difficulties in women. This topic is important to study because those who suffer from this problem may feel isolated which only adds to the problem. By researching sexual functioning and openly discussing the importance of a healthy sex life, we may be able to reduce the shame surrounding the topic.

In this study, I aim to contribute to the overall body of knowledge on this topic, while also adding a new element. Although the practice of mindfulness in a therapeutic setting has been shown to alleviate sexual dysfunction (Kimmes et al., 2015), I am interested in examining how a mindful attitude in one's daily life might have similar effects. Secondly, although sexual dysfunction is prevalent enough on college campuses to warrant research in that area (Chapa, Fish, Hagar & Wilson, 2018), most studies focus on women in the general public and clinical samples. For this reason, my study will be focusing on how trait-anxiety and mindfulness affect the sexual functioning of female college students. Additionally, most of the samples taken by previous researchers include almost exclusively white women. This study will focus on a primarily Hispanic demographic in order to diversify the literature.

The research question addressed in this study is "How do trait-anxiety and mindfulness relate to female sexual difficulties?" I hypothesize that women who report higher levels of anxiety will report more sexual difficulties

than those who have low anxiety, and those who report higher mindfulness levels will report lower levels sexual difficulty than those who report lower levels of mindfulness. This research was inspired by the Masters and Johnson (1970) theory of spectating. This theory suggests that those who overanalyze their own sexual performance during intercourse are more likely to have difficulties becoming aroused than those who focus of the sensations of the present moment (Masters & Johnson, 1970). This theory supports my hypothesis because it suggests that those who are experiencing more anxious thoughts will have more sexual difficulties. It also suggests that those who are able to experience the present moment without judgement will have more successful sexual functioning. This supports my hypothesis that higher mindfulness levels correlate with higher sexual functioning.

## Literature Review

### *Gender Differences in Sexual Functioning*

Bancroft (2002) explains some ways that men and women differ in terms of sexuality and why these differences may lead to women experiencing more psychologically related sexual dysfunction than men. Biologically, male orgasm and ejaculation are required for reproduction, but female pleasure is not. This makes it easier to suppress female sexuality than male sexuality. Historically, laws that were made by the church concerning what was acceptable sexual behavior often eliminated the possibility for female orgasm. Because missionary style, vaginal intercourse for the purpose of reproduction was largely considered the only acceptable type of sex, men were left satisfied while women were sexually neglected (Bancroft, 2002). Historically, women were shamed for their sexuality and those social influences may still play a role in the sexual difficulties experienced by some (Bancroft, 2002). Through the use of a questionnaire, Bancroft (2002) found that women may have a higher propensity for sexual inhibition than men. This is yet



another difference that may contribute to female sexual dysfunction. This article points out that, in order to understand female sexual dysfunction, we must study the psychological influences of the problem.

Hamilton and Julian (2014) also explore the gender difference in sexual functioning in their study in which stress factors were examined in relation to sexual functioning. In their study, 241 women and 169 men who were over 18 and sexually active took several surveys assessing their stress levels, sexual functioning, and anxiety and depression (Hamilton & Julian, 2014). The responses to the questionnaires indicated that women's sexual functioning is more strongly correlated with stress and depression than men's sexual functioning (Hamilton & Julian, 2014).

In order to understand female sexual dysfunction, it's necessary to have a tool that can accurately measure it. The Female Sexual Distress Scale-Revised was developed in order to assess the sexual functioning of women (DeRogatis, Clayton, LewisD'Agostino, Wunderlich, and Fu 2008). This scale was developed to measure distress levels, which is important because the definition of sexual dysfunction includes distress as one of the factors (Lehmiller, 2018). DeRogatis et. al. (2008) tested the reliability of the scale by administering it to 296 women between the ages of 18 and 50. The women took the survey, and then took it again 30 days later. The results showed a good test-retest reliability. High internal consistency was found using Cronbach's coefficient alpha (DeRogatis et. al., 2008). The scale was found to be reliable, and consistent.

### *Potential Causes of Sexual Difficulties*

Dove and Wiederman (2000) explored the question of what the potential causes of sexual difficulties may be in their study. Based on the concept of spectating by Masters and Johnson (1970), Dove and Wiederman (2000) explored the role of cognitive distraction in women's sexual functioning. Participants of the study included 115 women recruited from a university. Their ages ranged from 18 to 21 and they were all sexually active. The participants completed a booklet of surveys asking questions about their self-focus, sexual esteem, body satisfaction, life satisfaction, sexual attitude, and sexual desire. They were also asked questions about their spectating tendencies (Dove & Wiederman, 2000). After examining the results, researchers found that women who reported more cognitive distraction also reported lower sexual functioning including more rates of pretending orgasm and less sexual satisfaction (Dove & Wiederman, 2000). This study supports the idea that one's inability to remain in the present moment and immerse themselves in the sexual experience is related to more sexual difficulties.

Dettore, Pucciarelli, and Santarnecchi (2013) also tackled this question in their study. The researchers hypothesized that women who scored higher on an anxiety scale, would score lower on the female sexual functioning scale (Dettore et al., 2013). They gathered a group of women who were diagnosed with an anxiety disorder and gave them a questionnaire that measured their anxiety levels and one that measured their sexual functioning. They repeated this process with a group of women from the general population

who were not diagnosed with an anxiety disorder (Dettore et al., 2013). As hypothesized, the results showed that the women who were diagnosed with an anxiety disorder had lower rates of sexual functioning compared to those who did not suffer from anxiety (Dettore et al., 2013). This study provides evidence for the idea that anxiety (specifically trait-anxiety) is related to female sexual functioning.

Although there is strong evidence that psychological factors may cause sexual difficulties, there are also other explanations. Sexual difficulties may also be caused simply by physiological problems. For example, low testosterone, pelvic issues, and blood flow issues have been shown to cause sexual difficulties in women (Berman 2005). It is possible that women may experience pain due to a physiological problem during sex and become anxious because of the pain instead of having the anxiety cause the physical discomfort.

### *Combating Sexual Dysfunction*

Once the link between anxiety and female sexual functioning has been established, the next step is to examine possible treatments for anxiety related sexual dysfunction. Kimmes, Mallory, Cameron, and Kose (2015) emphasize the need for mindfulness and sex-positivity in sex therapy interventions. Kimmes et al. (2015) describe the therapeutic process of using mindfulness as an intervention method for sexual dysfunction. In a series of sessions, the therapist teaches the couple about mindfulness practices (such as body scans and sitting meditation), gives them individual assignments meant to increase their comfort with their own sexuality, and ultimately helps them to engage in mindful and non-judgmental intercourse with one another (Kimmes et al., 2015). Throughout the sessions, the therapist encourages sex-positivity and non-judgmental awareness of one's body and sensations (Kimmes et al., 2015). In a case study involving a couple suffering from sexual dysfunction, this approach was found to be very successful (Kimmes et al., 2015). The goal of this practice is to decrease one's anxiety enough to have a successful sexual encounter. The link between anxiety and sexual dysfunction is strongly supported through this study, because as the client was able to decrease their anxiety, their sexual functioning greatly improved.

Another study that supports the link between mindfulness and improved sexual functioning was conducted by Brotto and Basson (2014). In this study, the participants were made up of 115 women seeking treatment for diagnosed sexual desire or arousal disorders. The women were all between the ages of 19 and 65. The procedure started with women being clinically assessed and interviewed to ensure that they met the requirements to participate. The participants were split into two groups. One group would get treatment of mindfulness therapy immediately and the other would get delayed treatment. After completing a packet of questionnaires, women were brought in for an arousal assessment. Women in the immediate treatment group were then given treatment and then two weeks later had another in-person arousal assessment. The women in the delayed treatment group had another arousal assessment two weeks later without any treatment. Next both groups got treatment and completed

another assessment at a later date. When sexual desire scores were compared, the study showed that those who got treatment had a statistically significant change in desire, while those who did not get treatment did not have a statistically significant change. It was also found that when all participants had received treatment, there was a significant increase in desire and no difference between groups (Brotto & Basson, 2014).

Although these studies support the idea that mindfulness treatments are effective in improving sexual functioning, it could be argued that they do not fully support my hypothesis that more mindful people have less sexual difficulties. Mindfulness treatments and mindfulness as a trait are not necessarily the same. People who are mindful in character are still just as likely to have physiological issues that may cause sexual difficulties. For example, someone may be mindful, but still have low testosterone, which might cause sexual difficulties. However, my research seeks to explore this question. The results of my study may help future researchers explore mindfulness as a personality trait in relation to sexual functioning.

These studies demonstrate that sexual dysfunction is a problem that is often related to psychological factors such as anxiety. The prevalence of sexual dysfunction was explored, the relationship between sexual dysfunction and anxiety was established, and possible solutions for the problem were presented. Moving forward this study will examine the relationship that was explored by Dettore et al. (2013), while adding in the element of mindfulness practices and how they factor into this relationship. I hypothesize that higher levels of reported anxiety will be related to a decrease in sexual functioning.

## Methods

### Materials

Three surveys were used in this study. The Freiburg Mindfulness Inventory (FMI) (Walach, Buchheld, Buttenmüller, Kleinknecht, & Schmidt, 2006) is a 14-item questionnaire that assesses the participant's level of trait mindfulness. The responses refer to how often participants can relate to the experience outlined in the statement. The options are "rarely", "occasionally", "fairly often", and "almost always" (Walach et al., 2006). An example item is "I am open to the experience of the present moment." The FMI was found to be reliable ( $\alpha = .76$ ).

The Hospital Anxiety and Depression Scale measures participants anxiety and depression levels (Zigmond and Snaith, 1983). For the purpose of this study, I only used the anxiety subscale. There are 7 items measuring anxiety. The responses are ratings from 0-3. Zero being that they do not relate to the statement and 3 being that they relate to it very much. The wording of each response is slightly varied depending on the question. An example item on this scale is "I feel tense or 'wound up'." The Hospital Anxiety Subscale was also reliable ( $\alpha = .77$ ).

The Female Sexual Distress-Revised questionnaire (DeRogatis et al., 2008) consists of 13 questions about the frequency of feeling related to sexual distress. The questions were rated on a 5-point Likert scale from 0-4. 0 = "never", 1 = "rarely", 2 = "occasionally", 3 = "frequently", and 4 =

"always" (DeRogatis et al., 2008). An example item is "How often do you feel distressed about your sex life? The Female Sexual Distress-Revised questionnaire was also found to be reliable ( $\alpha = .93$ ).

### Participants

I collected 116 participants. Of the 116, 89 participants were sexually active females. Those who were male or not sexually active were excluded from the study. Participants were collected using SONA. This allowed me to collect data from Stanislaus State students. The participants ages ranged from 18 to 42 years old ( $M = 23.6$ ,  $SD = 4.98$ ). They also all had a similar educational background. The demographic was 88.6% Hispanic. This allows me to study a population that has previously been neglected from research on this topic.

### Design

This study is non-experimental, and it used a correlational design. Three scales were presented for participants to complete online. The Freiburg Mindfulness Inventory (FMI), the Hospital Anxiety and Depression Scale, and the Female Sexual Distress-Revised were presented in a randomized order. Using the information from these three scales, I examined the relationships between trait-anxiety, sexual difficulties and mindfulness.

### Procedure

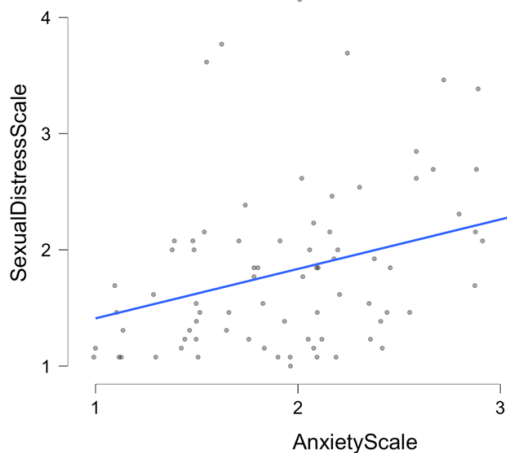
Participants accessed the survey through Qualtrics. I used SONA to advertise my survey. First, they answered the questions "Are you a female?" and "Are you sexually active." If they answer yes to both questions, they were able to move on to the first survey. First, they took the Mindfulness Inventory (FMI). Next, they took the Hospital Anxiety and Depression Scale. Finally, they took the Female Sexual Distress-Revised survey. After completing all the surveys, a message saying, "Thank you for your participation!" was displayed on the screen, and they were instructed to exit the screen. Participants were awarded 1 credit of extra credit as compensation for completing my study.

## Results

Through my research, I found that there is a positive correlation between sexual distress and anxiety (see Figure 1). Participants who scored higher on the Hospital Anxiety and Depression Scale scored higher on the Sexual Distress-Revised Questionnaire ( $r = .382$ ,  $N = 89$ ,  $p = .001$ ). I also found a negative correlation between mindfulness and sexual distress (see Figure 2). Those who scored higher on the Freiburg Mindfulness Inventory scored lower on the Sexual Distress-Revised Questionnaire ( $r = -.327$ ,  $N = 89$ ,  $p = .002$ ).

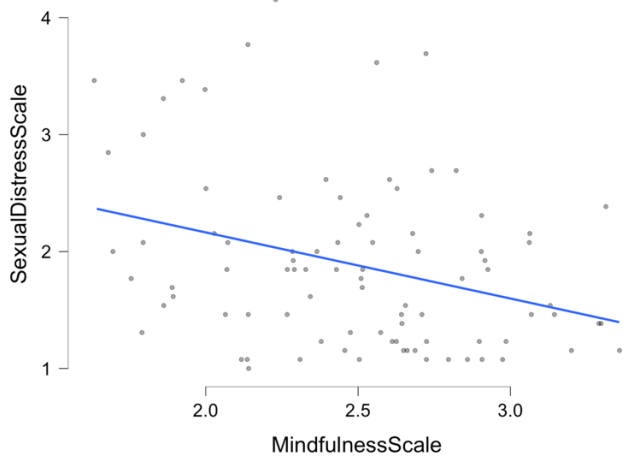
**Figure 1**

Scatterplot showing the linear relationship between scores on the Female Sexual Distress-Revised questionnaire and scores on the Hospital Anxiety scale



**Figure 2**

Scatterplot showing the linear relationship between scores on the Female Sexual Distress-Revised questionnaire and scores on the Mindfulness Inventory



## Discussion

The results of this study indicate that those who experience higher levels of trait-anxiety experience higher levels of sexual difficulties as well. This supports my hypothesis, and is consistent with previous research (Dettore et al., 2013). Additionally, my findings support my hypothesis that those who are more mindful, experience lower levels of sexual difficulties. This is also consistent with previous research (Kimmes et al., 2015; Brotto & Basson, 2014).

Some limitations of my research include a small sample size, as well as a limited population. Because my participants were collected from one campus and primarily one major (psychology), I cannot generalize my findings to a broader population. Additionally, because my research asks participants to answer sensitive questions, social desirability bias may have been an issue. Participants may have answered questions in the way that they thought was

socially acceptable rather than in an honest way.

A strength of my study is that it is easily replicable because I used surveys that are already developed, and the only materials needed are online. This ensures that my study could be conducted anywhere where people have access to survey materials or the internet. Another strength is that the population of participants who took my study were primarily Hispanic. This is a strength because my goal was to diversify the population of women whose sexual functioning is researched. Past research has focused mostly on White women. In the study by Dettore, et al. (2013), 100% of the participants were White women. Although the demographics were different, the results of this study were consistent with the results of the study by Dettore et al. (2013). Another difference in these studies is that, while Dettore et al. (2013) recruited women who were already diagnosed with an anxiety disorder to be the clinical sample. In my study, those who reported being more anxious were not necessarily diagnosed with a disorder. This makes my results more generalizable to the general public because it applies to those who have not necessarily been diagnosed with an anxiety disorder.

In future research, it may be beneficial to develop a study in which physiological measures of arousal could be used to measure sexual difficulties. This may help the results be more objective than when self-report measures are used. This research will help to spread understanding about sexual difficulties in women. Our society often feels uncomfortable with addressing issues of a sexual nature. The stigma against talking about the problems in one's sex life only perpetuate the discomfort. However, it is important for people to know about these issues so that, if they experience sexual difficulties themselves, or if their partners experience them, they will understand that this is a common problem and that there are solutions.

## Acknowledgements

I would like to thank my mentor, Dr. Luevano, for his support and guidance throughout this project.

## References

- [1] Bancroft, J. (2002). The Medicalization of female sexual dysfunction: the need for caution. *Archives of Sexual Behavior*, 31(5), 451–455. <https://doi.org/10.1023/A:1019800426980>
- [2] Berman, J. R. (2005). Physiology of female sexual function and dysfunction. *International Journal of Impotence Research*, 17(S1), S44–S51. <https://doi.org/10.1038/sj.ijir.390142>
- [3] Brotto, L. A., & Basson, M. (2014). Group mindfulness-based therapy significantly improves sexual desire in women. *Behaviour Research and Therapy*, 57, 43–54. <https://doi.org/10.1016/j.brat.2014.04.001>
- [4] Chapa, H. O., Fish, J. T., Hagar, C., & Wilson, T. (2018). Prevalence of female sexual dysfunction among women attending college presenting for gynecological care at a university student health

- center. *Journal of American College Health*, 68(1), 52–60.  
<https://doi.org/10.1080/07448481.2018.1515751>
- [5] Derogatis, L., Clayton, A., Lewis-Dagostino, D., Wunderlich, G., & Fu, Y. (2008). Validation of the Female Sexual Distress Scale-Revised for assessing distress in women with hypoactive sexual desire disorder. *The Journal of Sexual Medicine*, 5(2), 357–364.  
<https://doi.org/10.1111/j.1743-6109.2007.00672.x>
- [6] Dèttore, D., Pucciarelli, M., & Santaronecchi, E. (2013). Anxiety and female sexual functioning: an empirical study. *Journal of Sex & Marital Therapy*, 39(3), 216–240.  
<https://doi.org/10.1080/0092623X.2011.606879>
- [7] Dove, N. L., & Wiederman, M. W. (2000). Cognitive distraction and women's sexual functioning. *Journal of Sex & Marital Therapy*, 26(1), 67–78.  
<https://doi.org/10.1080/009262300278650>
- [8] Kimmes, J. G., Mallory, A. B., Cameron, C., & Köse, Ö. (2015). A treatment model for anxiety-related sexual dysfunctions using mindfulness meditation within a sex-positive framework. *Sexual and Relationship Therapy*, 30(2), 286–296.  
<https://doi.org/10.1080/14681994.2015.1013023>
- [9] Lehmiller, J. J. (2018). *The psychology of human sexuality*. Hoboken, NJ: Wiley Blackwell.
- [10] Walach, H., Buchheld, N., Buttenmüller, V., Kleinknecht, N., & Schmidt, S. (2006). Measuring mindfulness—the Freiburg Mindfulness Inventory (FMI). *Personality and Individual Differences*, 40(8), 1543–1555.  
<https://doi.org/10.1016/j.paid.2005.11.025>
- [11] Zigmond, A. S., & Snaith, R. P. (1983). Hospital Anxiety and Depression Scale. *PsycTESTS Dataset*. <https://doi.org/10.1111/j.1600-0447.1983.tb09716.x>